Drainage Reports

Abbreveated Water & Sewer Need Reports

Water Study

Wastewater Study

Stormwater Waiver Application

Preliminary

Drainage Report

Deer Valley Townhomes

NWC Miller Rd & Deer Valley

City of Scottsdale

Maricopa County, Arizona

TSC Project No. 0800

August 27, 2018

Prepared for:

Beardsley 22, Inc.

222 W Linger Lane

Phoenix, AZ 85021

consulting Terrascape

civil engineering • surveying • urban planning

Contents

Appendices

Preliminary

Drainage Report

Deer Valley Townhomes

NWC Miller Rd & Deer Valley

City of Scottsdale

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TSC Project No. 0800

July 18, 2018

Prepared for:

Beardsley 22, Inc.

222 W Linger Lane

Phoenix, AZ 85021

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Contents

Appendices

1.0 Introduction

1.1 Report Purpose

The purpose of this preliminary drainage report is to provide hydrologic and hydraulic documentation for the proposed Deer Valley Townhomes site. More specifically, a design review of surface grading, retention with bleed off and offsite flow that impacts the site. The project will be designed and developed in accordance with the City of Scottsdale and Maricopa County's current development standards and client requirements.

1.2 Site Description

The proposed Deer Valley Townhomes development (Project) consists of attached townhomes split between three (3) buildings on a one acre parcel. The Site is defined by the parcel boundary for APN# 212-02-010E and is located at the northwest corner of Miller Road and Deer Valley Road in Scottsdale (see figure 1 below). The current project zoning is PCOC and proposed project zoning is R-3. The majority of the Site is undeveloped. A regional drainage channel exists along the east property boundary in approximately a 50' wide drainage channel. The proposed development will be constructed all at once and will not be phased.

Figure 1: Location Map

1.3 Watershed Description

The existing land use in the watershed is mainly single family residential with a commercial/office/retail generally at the major corners. The project is located in the northeast corner of the Lower Rawhide Wash watershed identified in the Pinnacle Peak West ADMS. For reference, there are figures from the ADMS in **Appendix D**. The Site has a smaller sub-watershed that contributes to the channel on site. In general, the watershed slopes from the northeast to the southwest and extends up to the neighborhoods along Hayden Road just north of Pinnacle Peak Road. There are two areas that are channelized and combine into one channel and pass under Miller Road. The channel continues south on the west side of Miller Road and flows into a box culvert at the northeast corner of our Site. Flows continue south, along on the east side of the parcel within a public drainage easement, and enter a box culvert under Deer Valley Road. The stormwater empties into the Grayhawk channel that flows from east to west on the south side of Deer Valley Road.

1.4 On-Site Topographic Conditions

The existing ground generally slopes from northeast to southwest at approximately 2%. Exhibits provided in **Appendix B** present the existing topographic conditions for the Project. Both Miller Road and Deer Valley Road are fully improved and catch basin with grate and curb inlet exists in the north curb line of Deer Valley.

1.5 FEMA Flood Insurance Map

The project is entirely located within Zone "X" according to Flood Insurance Rate Map (FIRM) Panel 04013C1320L which is effective October 16, 2013 (REF 1). Zone X is defined as: 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile. (Please refer to FIRMETTE in **Appendix A**).

2.0 Technical Analysis

2.1 FLO-2D

A FLO-2D analysis was performed for the Rawhide Wash Watershed as part of the Pinnacle Peak West ADMP (PPW ADMP). Flood Control District of Maricopa County provided access to the FLO-2D Web Access Tool at https://gis.maricopa.gov/FLO-2DModels. **Appendix D** contains map output from the model and it is based on 100-year, 24 hour storm event. Flows were used from the cells 507866 through 507868, equaling 429 cfs. Terrascape agrees and accepts these results for use in performing analysis for this Site. In discussions with staff from the City of Scottsdale Stormwater Management

division, the City stated that these flow rates could be used in our HEC-RAS analysis and it was suggested that we apply a factor of safety (FS). An FS of 1.3 was applied to the flow rate, resulting in Q_{100}=557 cfs. The flow rates in the FLO-2D model result in lower values than that listed in the 1996 data from Arizona Silverado Preliminary Drainage Plan (Q=739cfs). It is typical to see lower flow rates when using historical rainfall data in the FLO-2D model, versus the other floodplain modeling used in older studies.

2.2 HEC-RAS

The 100-year, 24 hour flow rate obtained from the PPW ADMP was used, with a 1.3 factor of safety, as input for the HEC-RAS model. The purpose of the model was to determine the water surface elevations (WSE) in the channel in order to set the lowest finished floor elevations for the residential structures. The WSE are shown on the Preliminary Grading and Drainage Plan found in **Appendix B**. Output from the model is found in **Appendix E**. Model results show that the regional flows are contained within the channel and within the Site and Deer Valley Road box culverts.

2.3 Stormwater Storage Facilities

The Site is being developed on a parcel that was excluded from the Arizona Silverado subdivision. Developer and the City originally envisioned this Site to be a commercial development. Evidence of this can be seen by previous submittals made to the City by other developers, and are cited in the reference section. The significance of this project history and how it relates to stormwater storage. This parcel was not conceptually planned with the intent to provide regional stormwater conveyance and on-site stormwater storage design. There is not enough surface area to provide stormwater detention basins and therefore stormwater detention facilities with a bleed-off pipe is not feasible. Upon development of this Project, any runoff that exceeds the capacity of the storage facility would occur and pass prior to regional peak. This is due to a Site time of concentration of 5 or 10 min, versus a regional watershed time of concentration of 13.4 hours (Refer to Channel Hydrograph in **Appendix C**).

The drainage channel along the eastern portion of the property consumes approximately 30% of the Parcel. This is a significant impediment to the property and supports the request for a Stormwater Storage Waiver which accompanies this report. The FLO-2D and the HEC-RAS analyses show that there is sufficient capacity in the channel to handle post-development flows from this Site. The application form for the waiver states the following condition:

> "The development is adjacent to a conveyance facility that an engineering analysis shows is designed and constructed to handle the additional runoff from the site as a result of development."

Based on first flush design standard for computing retention volume, underground storage is proposed for this Project. The first flush volume calculation based on the Site's net area is based on Section 4-1.201 in the Design Standards & Policies Manual and provided in **Appendix C**.

2.4 Lowest Finished Floor Verification

All finished floors elevations have been set based on the water surface elevations in the adjacent channel. The Preliminary Grading & Drainage Plan is found in **Appendix B**. The northern 5-pack of townhouses is 2.93' above the WSE on the inlet side of the on-site culvert. The southern 2-pack along the channel is 1.93' higher than the SWE at the cross section on the outlet side of the on-site culvert.

The lowest elevation within the developed area is at a storm drain inlet within the trash turning maneuver area at the southwest corner. The elevation of the inlet is 75.50. If clogging or overflow occurs, the overtopping elevation is 76.00 for the top of curb adjacent to the inlet and on the east side of the driveway. Two locations are provided for ultimate outfalls; one at the southwest corner of the Site at elevation 75.0 and one into the channel at 74.60. Both locations route to the Greyhawk channel on the south side of Deer Valley Road.

2.5 Erosion Protection

It is our understanding that the regional channel was constructed with a minimum of 2' deep of 6" rip rap based on the 1996 Preliminary Drainage Plan for Arizona Silverado. Critical areas were specified as grouted rip rap, and evidence of this is seen at the inlet and outlet aprons to the box culverts on site. Terrascape made several attempts to obtain as-built plan data for Arizona Silverado subdivision from the City, engineering consultants, and the homeowner association. Data could not be located to determine the as-built channel plans. The aforementioned plan identified a design flow rate of 739 cfs. The rip rap should have been sized based on this flow, which is much larger than the flow rate in our analysis. Field observations indicate that the channel remains in good condition after 20 years and doesn't appear to have lateral migration.

Guideline 1 within State Standard Attachment 5-96, states that the section containing erosion setbacks applies to "Lateral Migration Setback Allowance for Riverine Floodplains in Arizona". The calculation for Level 1 analysis is:

$$\text{Setback} = 1.0(Q_{100})^{0.5}$$

The minimum erosion setback is 20 feet for straight channels. Based on the calculation, the minimum setback calculation for the flow rate used in the analysis is 23.6 feet. A LOMR with an effective date of August 25, 2017 determined that the Site is located in Zone "X", along with the properties in the immediate vicinity. Since the on-site channel is lined with rip rap, and there is no defined floodway, an erosion setback is not required as the rip rap mitigates the concern for lateral migration.

3.0 Report Conclusions

The following conclusions have been reached as a result of this drainage investigation, in support of the proposed Deer Valley Townhomes Project:

- This drainage report was prepared in accordance with the recommendations and design parameters from the *Design Standards & Policies Manual* (REF 2), and MCFCD *Drainage Design Manuals, Volume I and II* (REF 4&5).
- The required retention volume is provided based on first flush based on 2.37-inches of run-off, per City of Scottsdale requirements and is designed to drain within 36 hours.
- Building lowest finished floor elevations for the Project exceed a minimum of 12-inches above the 100-year 24-hour water surface elevations in the adjacent channel.

4.0 References

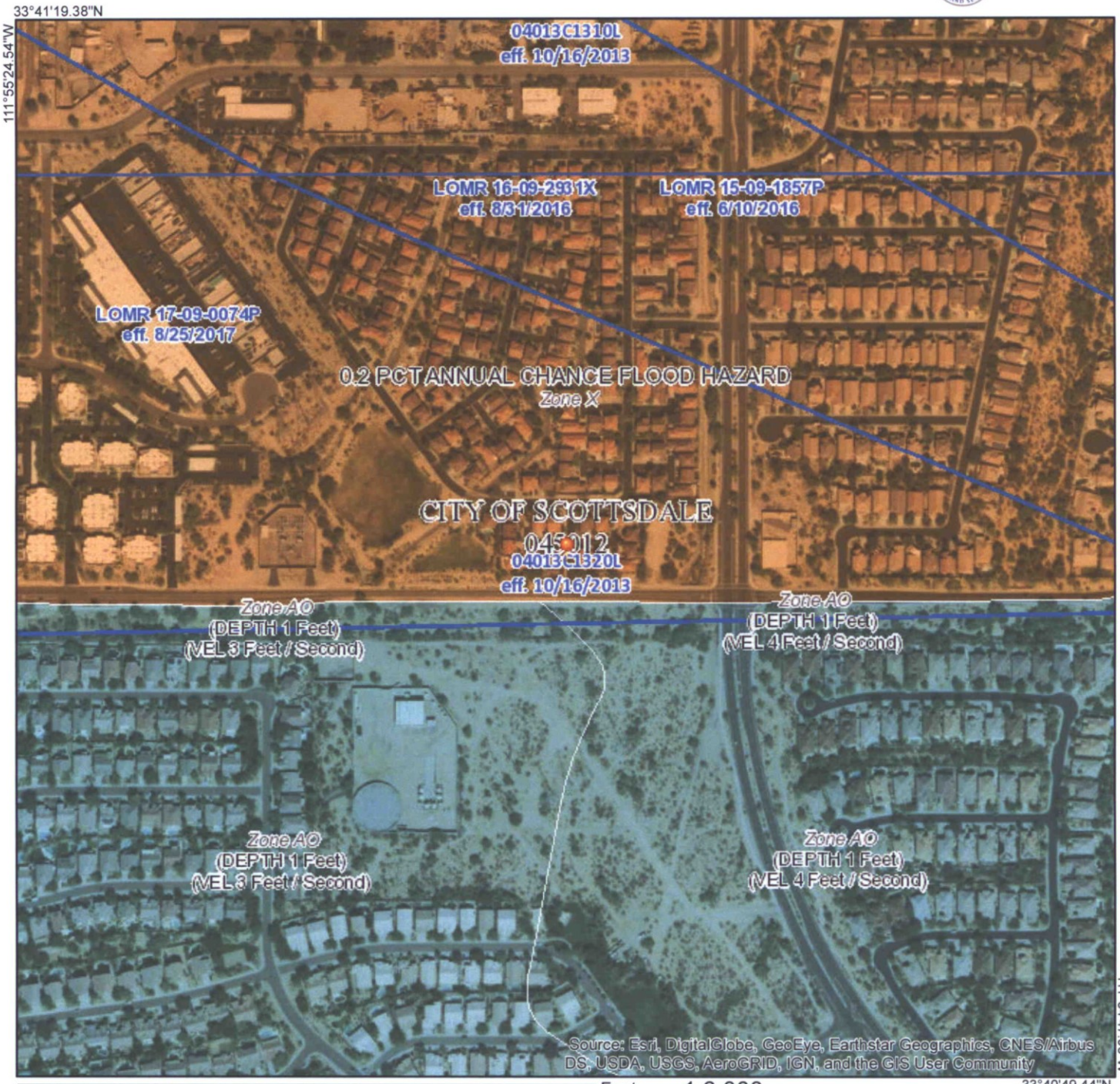
1. Flood Insurance Rate Map, Maricopa County, Arizona, Map Number 04013C1320L, Federal Emergency Management Agency, Washington DC, October 16, 2013.
2. Design Standards & Policies Manual, City of Scottsdale, AZ, 2018.
3. MAG Uniform Standard Details for Public Works Construction, Maricopa Association of Governments, Phoenix, AZ, 2015 Revision.
4. Drainage Design Manual for Maricopa County, Arizona – Hydrology, 4th Edition, Flood Control District of Maricopa County, Phoenix, AZ, August 15, 2013.
5. Drainage Design Manual for Maricopa County, Arizona – Hydraulics, 3rd Edition, Flood Control District of Maricopa County, Phoenix, AZ, August 15, 2013.
6. Watercourse System Sediment Balance, State Standard Attachment 5-96, Arizona Department of Water Resources, September 1996.
7. Preliminary Drainage Plan, Hook Engineering, Inc., Phoenix, AZ, May 9, 1997.
8. Pinnacle Peak West Area Drainage Master Study: Draft Hydrology & Hydraulics Report, Volumes 1&2, Flood Control District of Maricopa County Project No. F0701, TYLIN International, July 26, 2013.
9. Pinnacle Peak West Area Drainage Master Study: Rawhide Wash Alternatives Refinement, Flood Control District of Maricopa County, JE Fuller Hydrology & Geomorphology, Inc., June 2016.
10. Final Plat for Arizona Silverado, CMX Group, Inc., November 7, 1997.
11. Preliminary Drainage Plan for Arizona Silverado, Exhibit 1, Hook Engineering, Inc., May 9, 1997.
12. Conceptual Grading & Drainage Plan for Convenience Store/Bank, CMX Group, Inc., September 4, 1998.
13. Grayhawk Deer Valley Channel, Phase 1, Gilbertson Associates, Inc., March 31, 1995.
14. Preliminary Drainage Report for Commercial Site Development, Hook Engineering, Inc., October, 26, 2007.

Appendix A

Firmette

National Flood Hazard Layer FIRMette

FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth
- Regulatory Floodway *Zone AE, AO, AH, VE, AR*

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 — Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

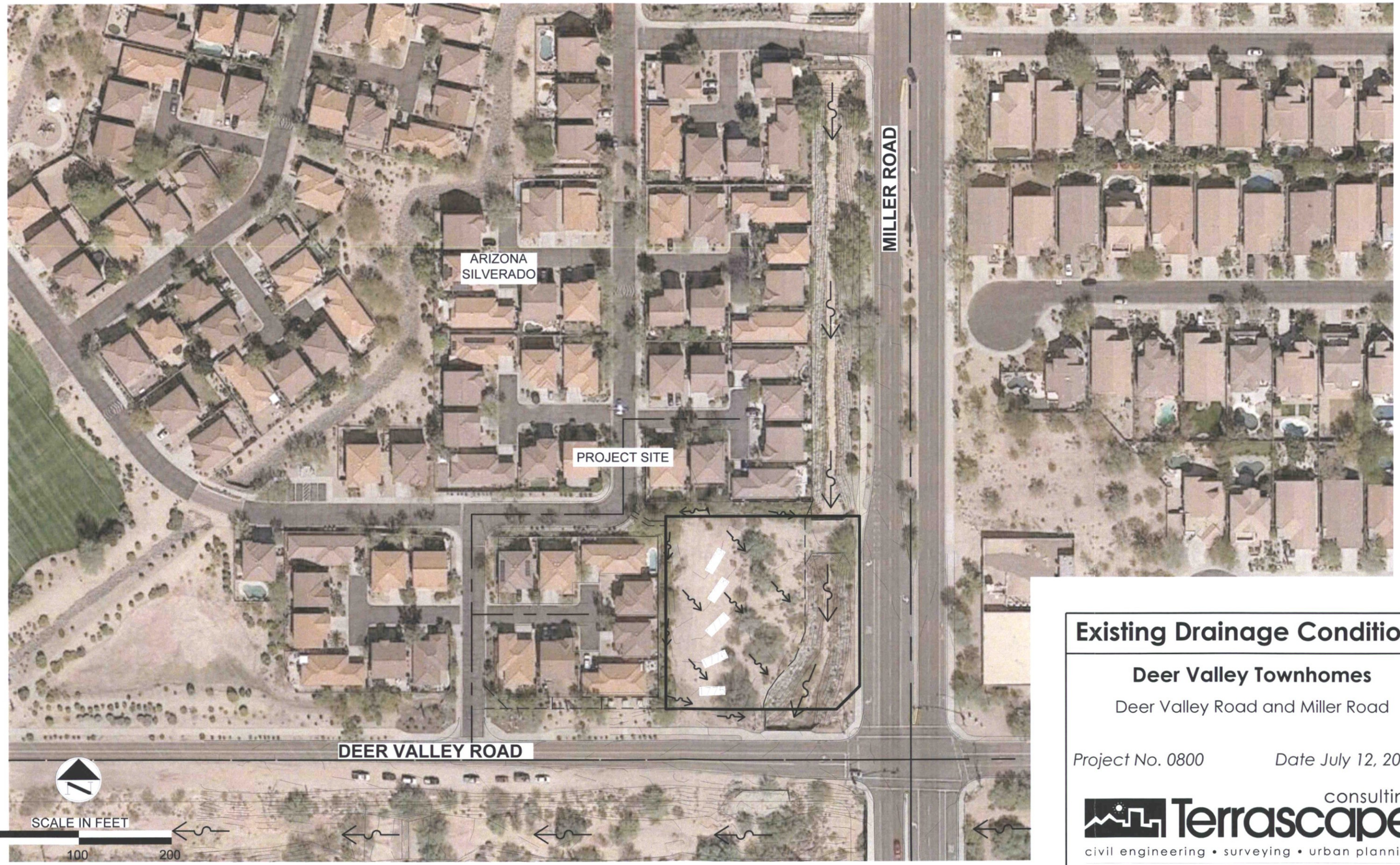
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The base map shown complies with FEMA's base map accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 4/26/2018 at 7:37:10 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: base map imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Appendix B

Drainage Exhibits & Existing Condition Maps



Existing Drainage Conditions

Deer Valley Townhomes

Deer Valley Road and Miller Road

Project No. 0800 *Date July 12, 2018*

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Plotted: 07/12/18 - 5:18 PM, By: TSC33
File: M:\0800 WP\ - Miller & Deer Valley - Scottsdale\DWG\Preliminary\0800-EXCON.dwg, ---> Layout1

First Flush Volume	
V= CDA**	V = First Flush Volume (cf)
	C = Average Runoff Coefficient*
	D = First Flush Precipitation Depth (ft)
	A = Net Area of Disturbed Area (sf)

$V = 0.94 \times 0.04 \times 29{,}597$

$V = 1168$ cf

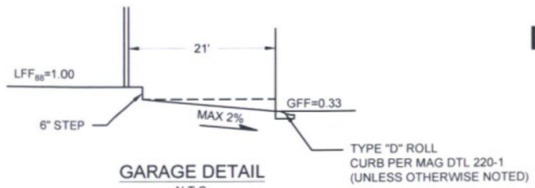
*C-Values are from FCDMC Hydrology Manual

**First Flush equation is from COS Design Manual

Volume Provided	
$V_P = \pi r^2 L$	V_P = Volume Provided (cf)
	r = Radius of Underground Storage Tank (ft)
	L= Length of Underground Storage Tank (ft)

$V_P = \pi(2.5)^2(62)$

$V_P = 1217$ cf



GARAGE DETAIL

N.T.S.

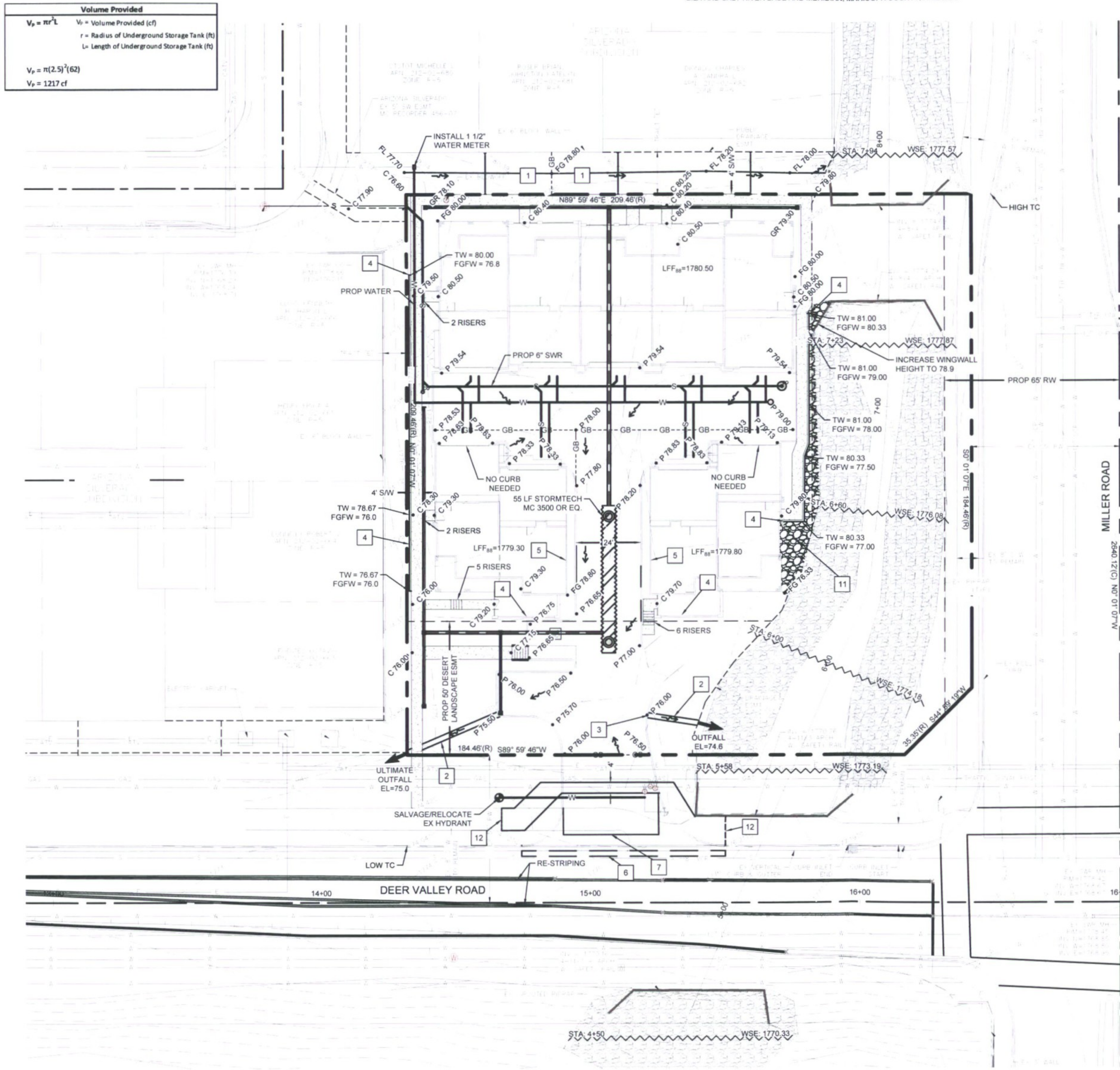
PRELIMINARY GRADING AND DRAINAGE PLAN FOR:

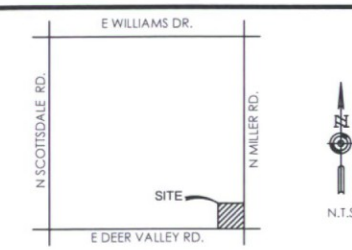
DEER VALLEY TOWNHOMES

N MILLER ROAD & E DEER VALLEY ROAD

SCOTTSDALE, ARIZONA

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.





VICINITY MAP

OWNER / DEVELOPER

BEARDSLEY 22, INC
222 W LINGER LN, PHOENIX, AZ 85021

CONTACT: SCOTT WARD
PHONE: (480) 899-4330
EMAIL: WARDDEVELOPMENT@YAHOO.COM

ARCHITECT

WHITNEYBELL PERRY, INC
575 W CHANDLER BLVD, SUITE 123
CHANDLER, ARIZONA 85224

CONTACT: TERESA HILL
PHONE: (480) 857-8364
EMAIL: TERESA@WHITNEYBELLPERRY.COM

CIVIL ENGINEER

TERRASCAPE CONSULTING
1102 EAST MISSOURI AVENUE
PHOENIX, ARIZONA 85014

CONTACT: LISA NELSON, P.E.
PHONE: (480) 454-1807
FAX: (602) 230-2458
EMAIL: LNELSON@TERRASCAPE.US

PROJECT DATA:

APN: 212-02-010E
NET AREA: 0.68 ACRES
PARCEL AREA: 1.00 ACRES

ADDRESS: 21818 N MILLER RD, SCOTTSDALE, AZ 85255

BASIS OF BEARING

THE SOUTH LINE OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST. SAID LINE HAVING AN ASSUMED BEARING OF N 89° 32' 09" E.

BENCHMARK

A CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE AT THE INTERSECTION OF SCOTTSDALE ROAD AND DEER VALLEY ROAD, C.O.S ELEVATION = 1747.03 (NAVD 88).

FLOOD INFORMATION

FLOOD ZONE DESIGNATION "X" F.E.M.A. FLOOD INSURANCE RATE MAP, MAP NUMBER 04013C1320L, PANEL 1320 OF 4425, DATED AUGUST 25, 2017. ZONE "X" AREAS DETERMINED TO BE OUTSIDE OF 0.2% ANNUAL CHANCE FLOODPLAIN.

LEGEND

- BOUNDARY
- EX PROPERTY LINE
- SETBACK
- EASEMENT
- STORM DRAIN
- SANITARY SEWER LINE
- DOMESTIC WATERLINE
- FIRELINE
- DRYWELL
- STORMTECH RETENTION TANK
- GRADE BREAK LINE
- FIRE HYDRANT
- CLEAN OUT WITH COLLAR
- CLEAN OUT
- VALVE
- 4' MANHOLE
- CATCH BASIN
- YARD DRAIN
- BACKFLOW PREVENTER
- WATER METER
- FINISHED GRADE
- HEC-RAS CROSS SECTIONS WATER SURFACE ELEVATION

ABBREVIATIONS

BLDG	BUILDING	LS	LANDSCAPE
C	CONCRETE	MH	MANHOLE
C&G	CURB AND GUTTER	P	PAVEMENT
CO	CLEAN OUT	PROP	PROPOSED
CMP	CORRUGATED METAL PIPE	PUE	PUBLIC UTILITY EASEMENT
DIA	DIAMETER	RW	RIGHT OF WAY
ESMT	EASEMENT	SB	SETBACK
EX	EXISTING	SS	SANITARY SEWER
FFE	FINISHED FLOOR ELEVATION	S/W	SIDEWALK
FGFW	FINISHED GRADE AT FOOT OF WALL	TC	TOP OF CURB
FL	FLOWLINE	TYP	TYPICAL
G	GUTTER	TW	TOP OF WALL
GR	GRATE	WSE	WATER SURFACE ELEVATION
HP	HIGH POINT		

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
5. EXPOSED STEM WALL; REFER TO ARCHITECTURAL PLANS.
6. MIN. 2' SAWCUT AND REMOVE EX. A.C.C.P. ROADWAY. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.
7. INSTALL M-2 DRIVEWAY PER C.O.S. STD. DTL. 2255; SIDEWALK MODIFIED PER PLAN.
8. WIDEN A.C.C.P. ROADWAY TO LIMITS SHOWN.
9. OBLITERATE PAVEMENT MARKINGS
10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING
12. SAWCUT, REMOVE, AND DISPOSE OF CONCRETE TO LIMITS SHOWN OR NEAREST EXPANSION JOINT, EXACT LIMITS TO BE DETERMINED IN THE FIELD. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.

SCALE IN FEET 0 20 40

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41715 LISA NELSON 07/10/18

EXPIRES 12/31/2019

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation. ARIZONA811 Call 811 or click Arizona811.com

DATE	DESCRIPTION
07/10/18	CLIENT REVIEW

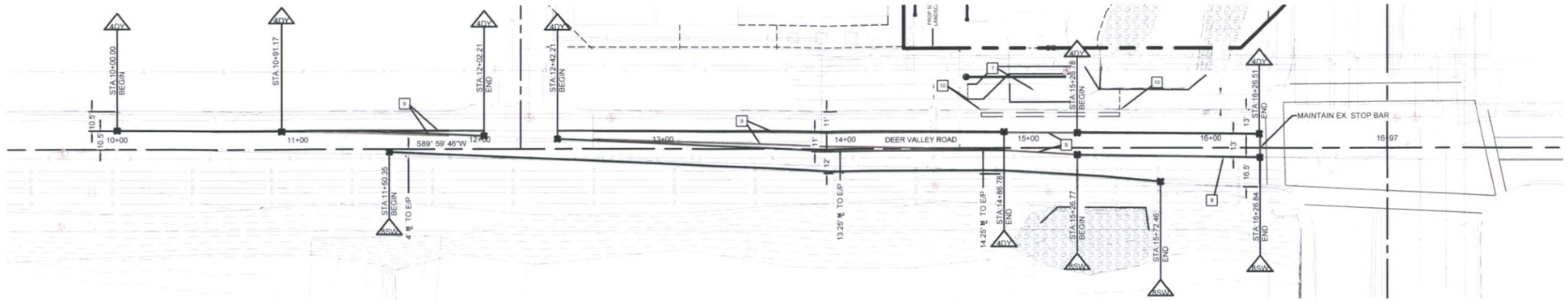
CHECKED BY: LMN

DRAWN BY: CMA

TITLE: PRELIMINARY GRADING & DRAINAGE PLAN

SHEET No. 1 of 2

PROJECT No. 0800



LEGEND

- 8" SOLID WHITE LINE
- 4" DOUBLE YELLOW LINE

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
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9. OBLITERATE PAVEMENT MARKINGS
10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING

SCALE IN FEET
0 30 60

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41715
LISA
NELSON
07/10/18
EXPIRES 12/31/2019

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or visit Arizona811.com

DATE	DESCRIPTION
07/10/18	CLIENT REVIEW

CHECKED BY: LMN
DRAWN BY: CMA
TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**
SHEET No. **2 of 2**
PROJECT No. **0800**

Appendix C

Calculations

First Flush Volume

V= CDA**

V = First Flush Volume (cf)
C = Average Runoff Coefficient*
D = First Flush Precipitation Depth (ft)
A = Net Area of Disturbed Area (sf)

V =	0.94	x	0.042	x	29,597
V =	1,168 cf				

*C-Values are from FCDMC Hydrology Manual
**First Flush equation is from COS Design Manual

Volume Provided

Number of chambers		6	Volume Per Chamber	110 cf
Number of End Caps		2	Volume Per End Cap	16 cf
Area		440 sf	Excavation Length	52 lf
Perimeter		121 ft	Excavation Width	8 lf
Stone above		12 in	Excavation Depth (Including cover)	6 lf
Stone below		9 in		
Voids in stone		40 %		
Length of Isolator Row		47 ft		
Volume in chambers	**# of Chambers * 109.9**	659 cf		
Volume in End Caps	**# of caps * 15.6**	31 cf		
Volume of excavation	**L X W X D**	2422 cf		
Amount of stone	**Vexc - Vchmb**	1731 cf		
Volume in stone	**Void % * Amount$_{stone}$**	693 cf		
Amount of Filter Fabric	**2*Area + Perimeter *(6 +Cover)**	1822 sf		
Volume Provided	**$V_{chmb} + V_{stone}$**	1352 cf		

Pre vs. Post

V = ΔC(R/12)A

V = Volume (cf)
ΔC = Change in Runoff Coefficient Over Disturbed Area*
R= Precipitation Amount (in)**
A= Disturbed Area (sf)

ΔC = $C_{post} - C_{pre}$
= 0.94 - 0.44
= 0.5
V = 0.50 x (2.37/12) x 29,597
V = 2,923 cf

*C-Values are derived from FCDMC Hydrology Manual
**100-year 2-hour precipitation from NOAA

NOAA Atlas 14, Volume 1, Version 5
Location name: Scottsdale, Arizona, USA*
Latitude: 33.6846°, Longitude: -111.9173°
Elevation: 1777.81 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.203 (0.169-0.249)	0.265 (0.222-0.326)	0.358 (0.296-0.438)	0.429 (0.353-0.523)	0.524 (0.425-0.636)	0.597 (0.477-0.720)	0.671 (0.528-0.807)	0.745 (0.577-0.896)	0.845 (0.637-1.02)	0.921 (0.681-1.11)
10-min	0.309 (0.257-0.380)	0.404 (0.338-0.496)	0.545 (0.451-0.667)	0.653 (0.537-0.796)	0.798 (0.646-0.969)	0.908 (0.727-1.10)	1.02 (0.803-1.23)	1.13 (0.878-1.36)	1.29 (0.970-1.55)	1.40 (1.04-1.69)
15-min	0.384 (0.319-0.471)	0.500 (0.419-0.615)	0.676 (0.559-0.827)	0.810 (0.666-0.987)	0.989 (0.801-1.20)	1.13 (0.901-1.36)	1.27 (0.996-1.52)	1.41 (1.09-1.69)	1.59 (1.20-1.92)	1.74 (1.28-2.10)
30-min	0.516 (0.429-0.634)	0.674 (0.564-0.828)	0.910 (0.753-1.11)	1.09 (0.898-1.33)	1.33 (1.08-1.62)	1.52 (1.21-1.83)	1.71 (1.34-2.05)	1.89 (1.47-2.28)	2.15 (1.62-2.58)	2.34 (1.73-2.82)
60-min	0.639 (0.531-0.784)	0.834 (0.698-1.02)	1.13 (0.932-1.38)	1.35 (1.11-1.65)	1.65 (1.34-2.00)	1.88 (1.50-2.26)	2.11 (1.66-2.54)	2.34 (1.81-2.82)	2.66 (2.01-3.20)	2.90 (2.14-3.49)
2-hr	0.744 (0.626-0.894)	0.963 (0.813-1.16)	1.28 (1.07-1.54)	1.53 (1.26-1.83)	1.86 (1.52-2.21)	2.11 (1.71-2.50)	2.37 (1.88-2.81)	2.62 (2.06-3.11)	2.97 (2.28-3.52)	3.24 (2.43-3.86)
3-hr	0.814 (0.684-0.995)	1.04 (0.880-1.28)	1.36 (1.14-1.66)	1.62 (1.34-1.96)	1.97 (1.61-2.38)	2.25 (1.82-2.70)	2.54 (2.01-3.05)	2.85 (2.22-3.41)	3.26 (2.47-3.91)	3.60 (2.66-4.31)
6-hr	0.976 (0.840-1.16)	1.23 (1.06-1.46)	1.57 (1.35-1.86)	1.84 (1.56-2.17)	2.21 (1.85-2.59)	2.50 (2.06-2.91)	2.80 (2.27-3.26)	3.11 (2.48-3.62)	3.52 (2.73-4.10)	3.84 (2.92-4.48)
12-hr	1.12 (0.967-1.31)	1.41 (1.22-1.65)	1.77 (1.53-2.07)	2.06 (1.77-2.40)	2.46 (2.08-2.85)	2.75 (2.30-3.19)	3.07 (2.53-3.55)	3.38 (2.75-3.91)	3.79 (3.01-4.41)	4.11 (3.20-4.81)
24-hr	1.31 (1.15-1.52)	1.67 (1.46-1.93)	2.16 (1.89-2.50)	2.55 (2.22-2.95)	3.11 (2.68-3.58)	3.55 (3.03-4.08)	4.01 (3.39-4.62)	4.49 (3.75-5.18)	5.16 (4.23-5.98)	5.70 (4.60-6.65)
2-day	1.44 (1.25-1.66)	1.84 (1.60-2.12)	2.41 (2.10-2.77)	2.87 (2.49-3.30)	3.52 (3.02-4.04)	4.03 (3.43-4.63)	4.58 (3.86-5.27)	5.15 (4.29-5.95)	5.95 (4.87-6.91)	6.59 (5.32-7.71)
3-day	1.54 (1.35-1.77)	1.98 (1.73-2.26)	2.61 (2.28-2.98)	3.12 (2.72-3.56)	3.85 (3.33-4.39)	4.44 (3.80-5.07)	5.07 (4.30-5.81)	5.73 (4.81-6.60)	6.68 (5.50-7.73)	7.45 (6.05-8.69)
4-day	1.65 (1.45-1.88)	2.11 (1.86-2.41)	2.81 (2.47-3.19)	3.37 (2.95-3.82)	4.18 (3.63-4.75)	4.84 (4.17-5.51)	5.56 (4.74-6.34)	6.32 (5.33-7.25)	7.41 (6.14-8.56)	8.31 (6.78-9.67)
7-day	1.87 (1.64-2.15)	2.40 (2.10-2.74)	3.19 (2.79-3.65)	3.84 (3.34-4.38)	4.77 (4.12-5.44)	5.53 (4.74-6.32)	6.35 (5.39-7.29)	7.24 (6.06-8.35)	8.50 (7.00-9.88)	9.55 (7.74-11.2)
10-day	2.04 (1.79-2.33)	2.61 (2.30-2.99)	3.47 (3.04-3.95)	4.17 (3.63-4.74)	5.16 (4.47-5.87)	5.97 (5.12-6.80)	6.84 (5.81-7.81)	7.77 (6.53-8.92)	9.09 (7.51-10.5)	10.2 (8.27-11.9)
20-day	2.54 (2.24-2.90)	3.28 (2.89-3.73)	4.34 (3.81-4.92)	5.16 (4.51-5.84)	6.27 (5.46-7.12)	7.15 (6.18-8.12)	8.05 (6.92-9.19)	8.99 (7.65-10.3)	10.3 (8.63-11.9)	11.3 (9.37-13.1)
30-day	3.00 (2.63-3.41)	3.86 (3.40-4.39)	5.10 (4.48-5.79)	6.06 (5.31-6.86)	7.36 (6.41-8.34)	8.37 (7.24-9.49)	9.42 (8.10-10.7)	10.5 (8.94-11.9)	12.0 (10.1-13.7)	13.1 (10.9-15.1)
45-day	3.52 (3.11-3.99)	4.54 (4.01-5.15)	6.00 (5.30-6.79)	7.11 (6.25-8.04)	8.59 (7.51-9.73)	9.73 (8.45-11.0)	10.9 (9.40-12.4)	12.1 (10.3-13.8)	13.7 (11.6-15.8)	14.9 (12.5-17.4)
60-day	3.92 (3.47-4.43)	5.07 (4.49-5.73)	6.69 (5.91-7.54)	7.88 (6.94-8.89)	9.46 (8.29-10.7)	10.7 (9.28-12.1)	11.9 (10.3-13.5)	13.1 (11.2-14.9)	14.7 (12.5-16.9)	15.9 (13.4-18.5)

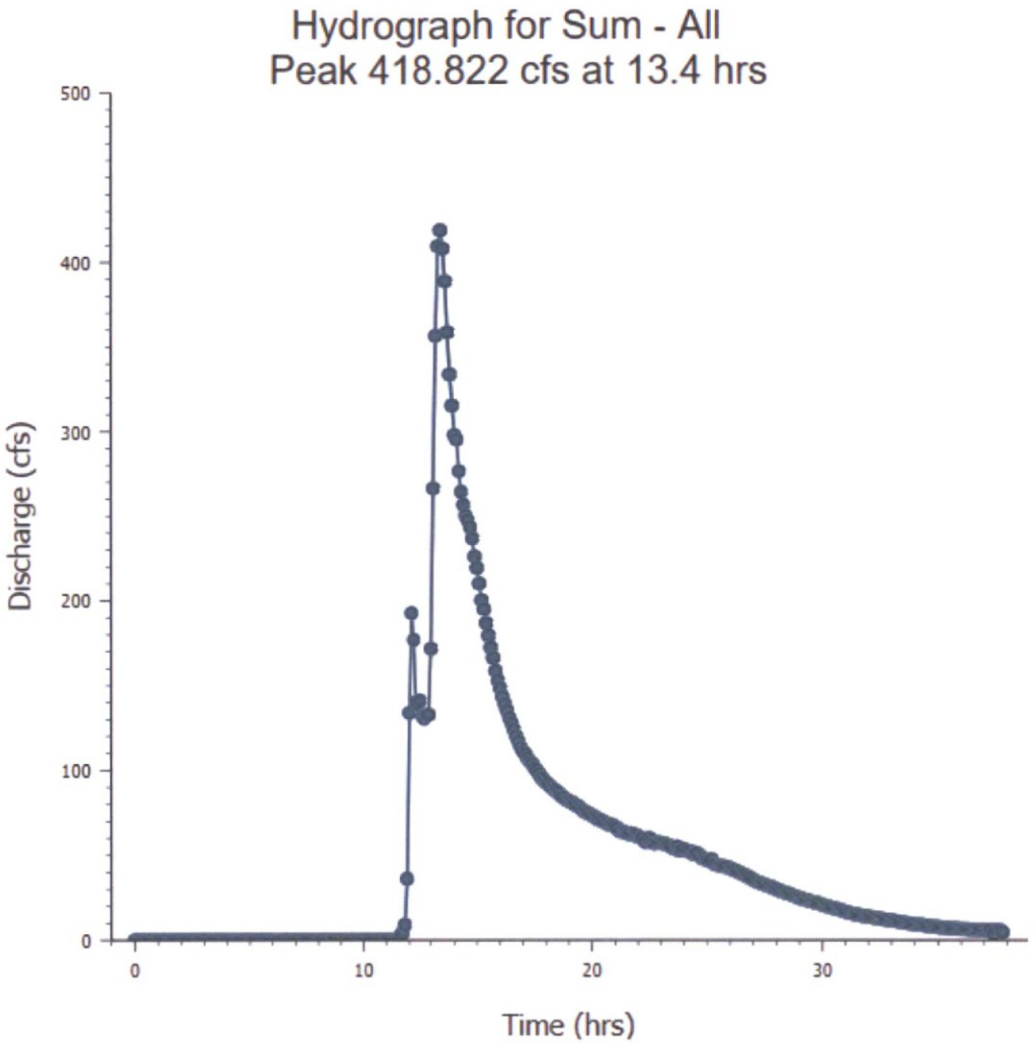
[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical


Hydrograph for Sum - All
Peak 418.822 cfs at 13.4 hrs
Discharge (cfs)
500
400
300
200
100
0
0
10
20
30
Time (hrs)

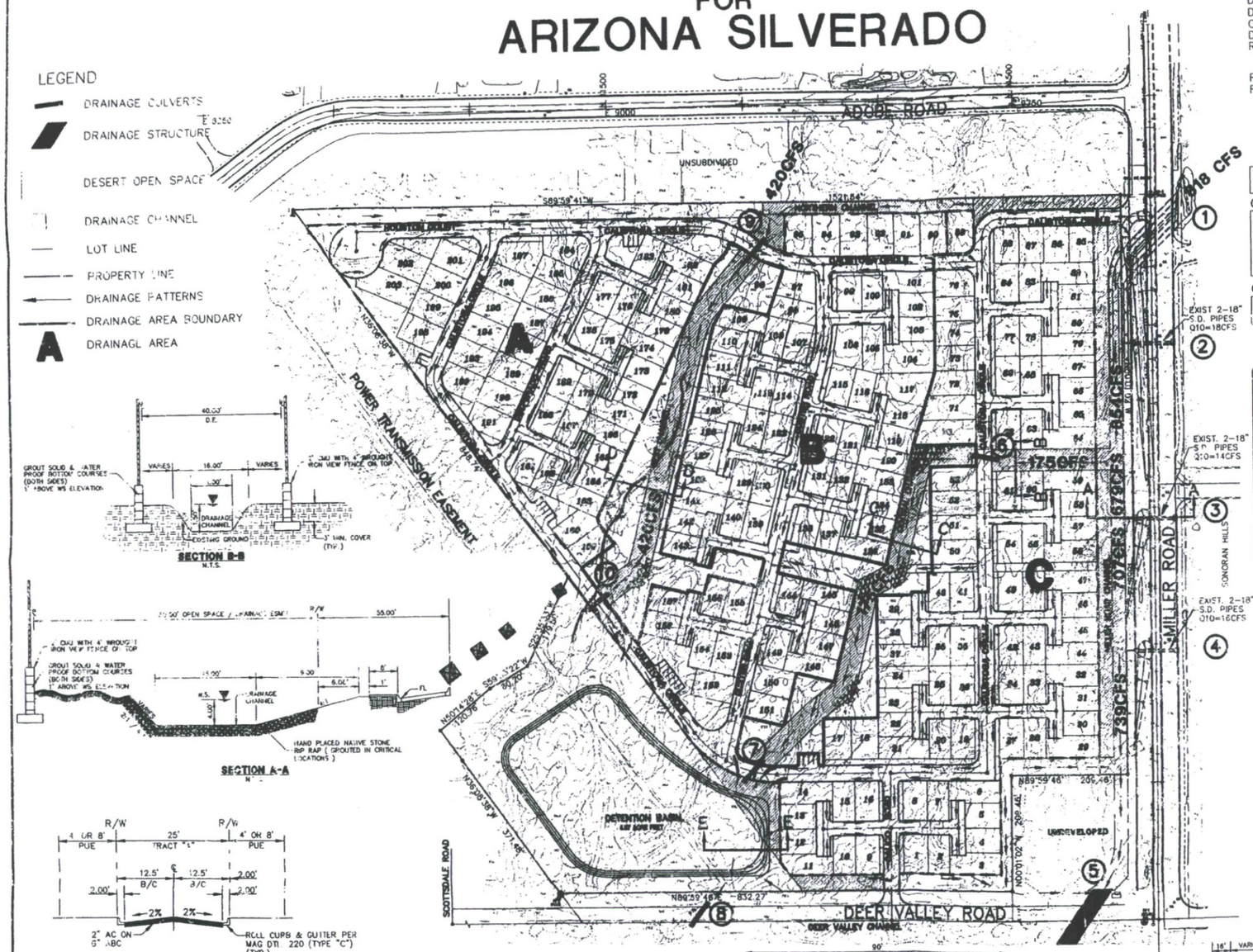
Appendix D

Supplemental Information

PRELIMINARY DRAINAGE PLAN
FOR
ARIZONA SILVERADO

EXHIBIT 1

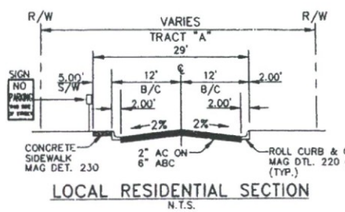
LEGEND
- DRAINAGE CULVERTS
- DRAINAGE STRUCTURE
- DESERT OPEN SPACE
- DRAINAGE CHANNEL
- LOT LINE
- PROPERTY LINE
- DRAINAGE PATTERNS
- DRAINAGE AREA BOUNDARY
- A — DRAINAGE AREA



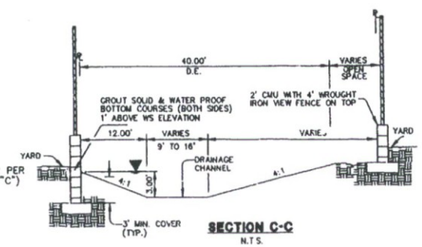
SECTION B-B
N.T.S.

SECTION A-A
N.T.S.

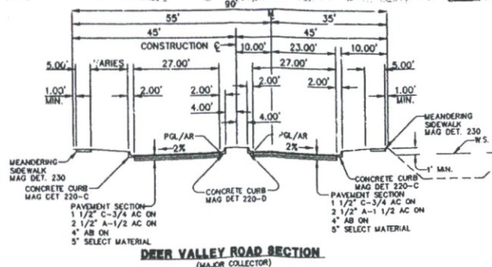
LOCAL RESIDENTIAL SECTION
N.T.S.



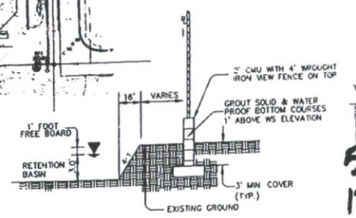
LOCAL RESIDENTIAL SECTION
N.T.S.



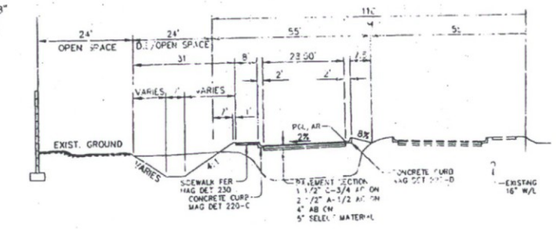
SECTION C-C
N.T.S.



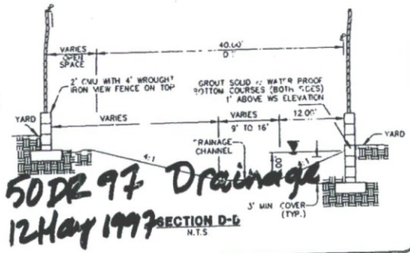
DEER VALLEY ROAD SECTION
(MAJOR COLLECTOR)
LOOKING EAST
N.T.S.



SECTION E-E
N.T.S.



OFF SITE STREET
MILLER ROAD SECTION
(MINOR ARTERIAL)
LOOKING NORTH
N.T.S.



50DR97 Drainage
12May1997 SECTION D-D
N.T.S.

DRAINAGE AREAS

DRAINAGE AREA A	= 5.43 ACRES
DRAINAGE AREA B	= 7.90 ACRES
DRAINAGE AREA C	= 8.92 ACRES
CHANNEL AREA	= 3.73 ACRES
DESERT OPEN SPACE	= 5.60 ACRES
RETENTION BASIN	= 2.50 ACRES
	34.08 ACRES

RETENTION BASIN VOLUME PROVIDED = 6.87 ACRE FEET
RETENTION BASIN VOLUME REQUIRED = 6.56 ACRE FEET

SCALE: 1" = 100'
0 100 200 300

ARIZONA SILVERADO
HYDROLOGY SUMMARY

DRAINAGE BASIN	FREQUENCY (YEAR)	EXISTING DISCHARGE (CFS)	DEVELOPED DISCHARGE (CFS)	COMMENTS
ON-SITE			FROM / TO	
A	10	76	24.9/22.2	RATIONAL METHOD
	100	101	37.8/41.4	
B	10	93	33.7/39.5	
	100	14	51.9/60.2	
C	10	8	32.9/42.4	
	100	147	51.2/65.8	
OFF-SITE				
A12			629	SONORAN HILLS EPIE & ASSOC. INC
A13			672	

ARIZONA SILVERADO
CULVERT ANALYSIS SUMMARY

CULVERT NO.	STREET NAME	NUMBER BARRELS	SIZE	TYPE	DISCHARGE IN CFS	DISCHARGE/ BARREL	LENGTH	INLET DEPTH	OUTLET VELOCITY	COMMENTS
1	MILLER RD	5	8'X4'	CBC	318	164	115.7	4.17	5.1	EXIST 175 CFS TO CENTRAL CHANNEL
2	MILLER RD	2	18"	CONC	18	9	100	*	5.09	REQUIRES EXTENSION TO THE WEST
3	MILLER RD	2	12"	CONC	14	7	100	*	3.96	REQUIRES EXTENSION TO THE WEST
4	MILLER RD	2	18"	CONC	16	8	100	*	4.53	REQUIRES EXTENSION TO THE WEST
5	DEER VALLEY RD	4	8'X4'	CBC	739	185	116	4.03	5.78	
6	CALISTOGA CR	2	48"	RCP	175	88	40	4.49	9.73	
7	CALISTOGA CR	2	48"	RCP	175	88	40	4.49	9.71	
8	DEER VALLEY RD	2	66"	RCP	309	155	40	6.17	7.79	
9	CALISTOGA CR	3	66"	RCP	420	140	40	5.75	7.3	
	CALISTOGA CR	3	48"	RCP	420	140	40	6.05	7.3	

* DISCHARGES OBTAINED FROM "AS BUILT" PLANS

KAUFMAN & BROAD OF ARIZONA, INC.
432 NORTH 44th STREET, SUITE 115
PHOENIX, ARIZONA 85008
TELEPHONE (602) 306-1000 FAX (602) 306-1010

HOOK ENGINEERING INC.
Consulting Engineers * Land Surveyors
3511 E. INDIAN SCHOOL ROAD * PHOENIX, ARIZONA 85018
TEL: (602) 956-3200 * FAX: (602) 955-5443

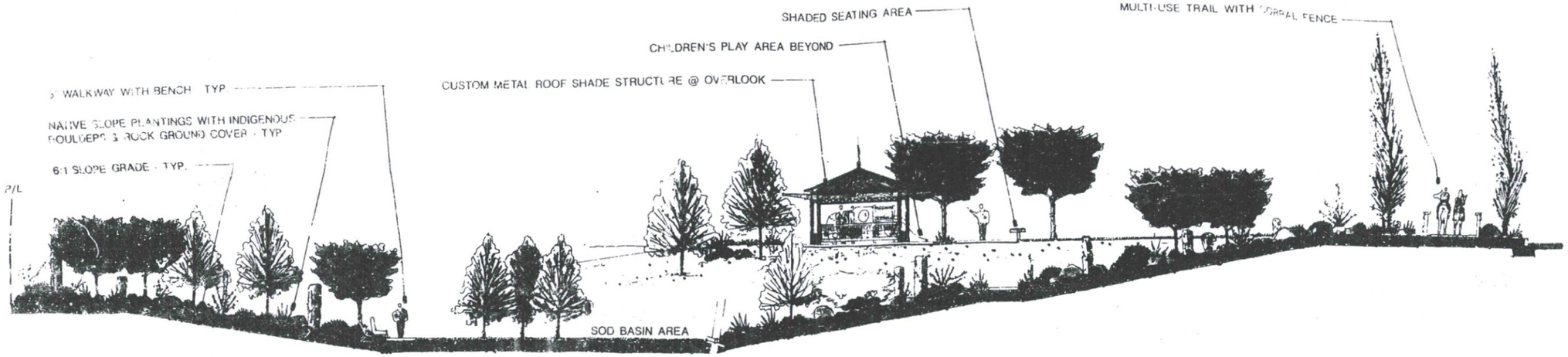
REVISIONS

NO	DATE	DESCRIPTION
1	5/9/97	LOT LAYOUT

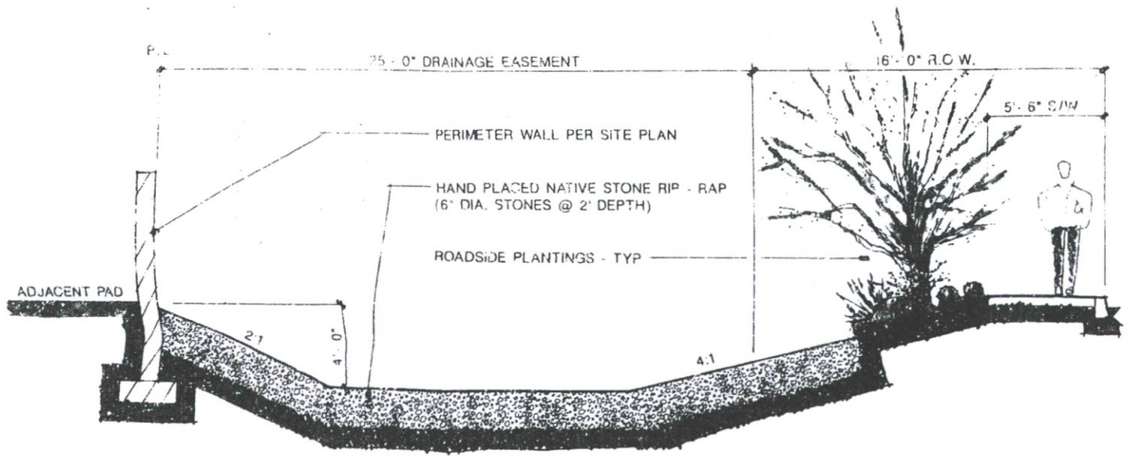
JOB NO 3389
SHEET 1 OF 1

G:\3389\GRADING\3389G01 Mon May 12 08:08:01 1997 Plotted by PC

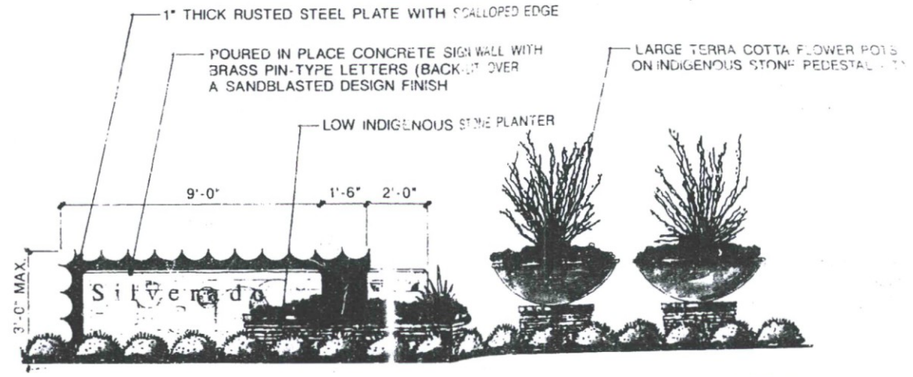
ARIZONA SILVERADO
KAUFMAN AND BROAD, ARIZONA



SECTION A - A — 1/8" = 1'-0"



SECTION B - B — 3/8" = 1'-0"



ENTRY SIGNAGE ELEVATION — 1/2" = 1'-0"

CONCEPTUAL SITE SECTIONS AND ELEVATIONS

JANUARY 17, 1997

Pinnacle Peak West ADMS Executive Summary

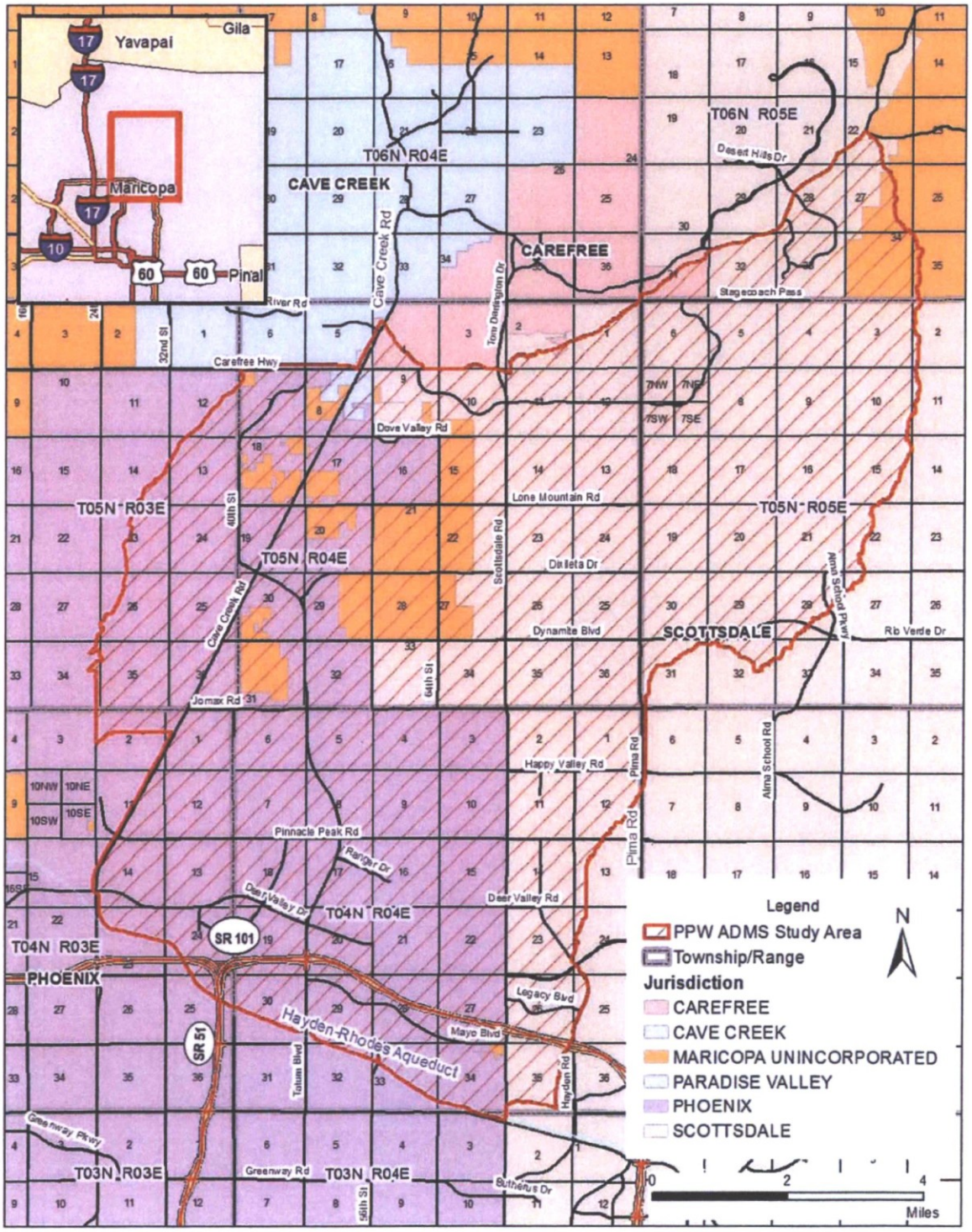


Figure 1. PPW ADMS Vicinity Map

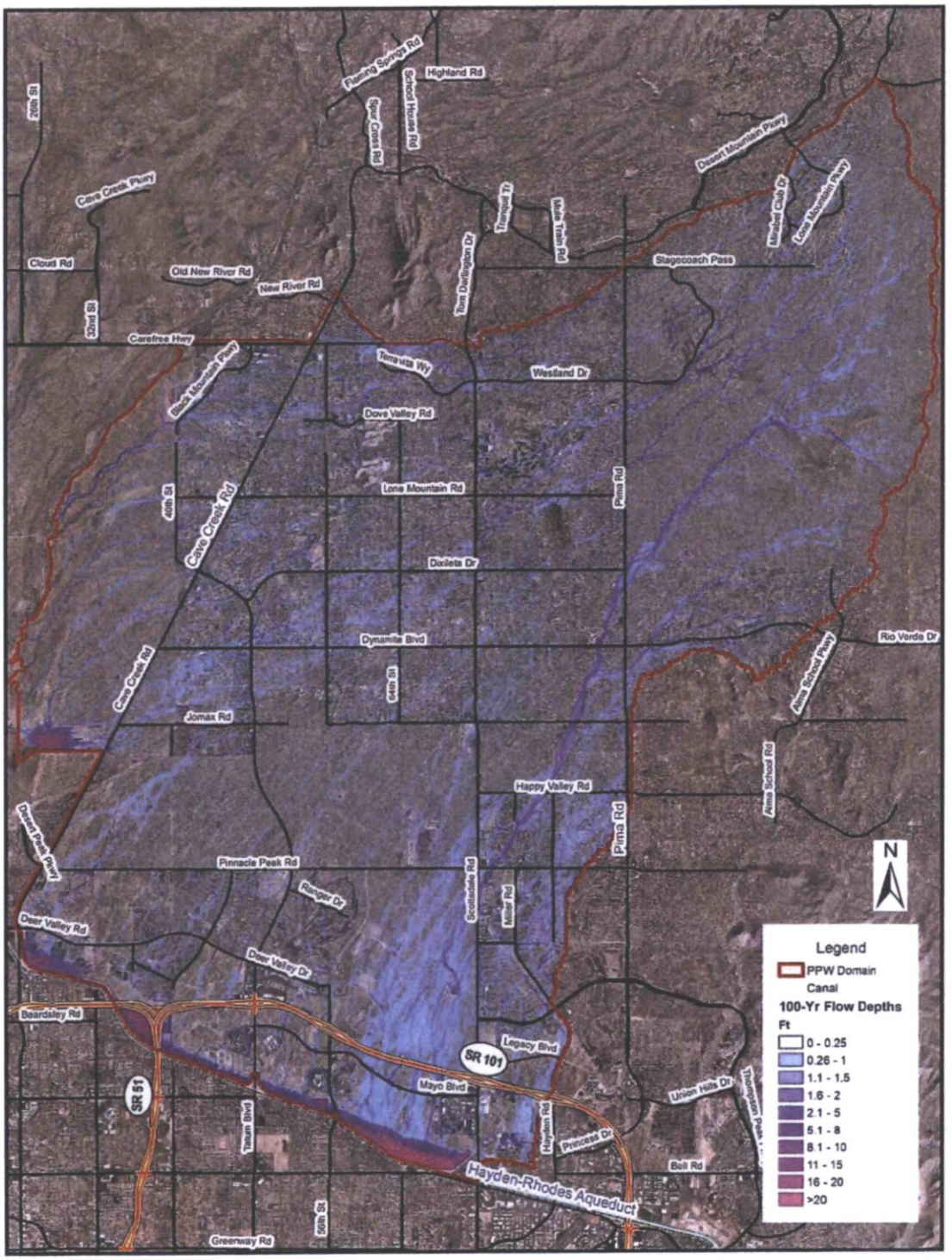


Figure 3. 100-Year Flow Depth Results

121_PinnaclePeakWest - Lower Rawhide 100YR24HR With Walls

July 13, 2018

1:480

0 20 40 80 ft

0 5 10 20 m

121_PinnaclePeakWest - Lower Rawhide 100YR24HR With Walls

May 17, 2018

1:9,600

0 600 1,200 2,400 ft

0 190 380 760 m

ADVANCED DRAINAGE SYSTEMS, INC.

Deer Valley Townhomes at Miller Rd and Deer Valley Rd

Scottsdale, Arizona

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-3500 OR APPROVED EQUAL.
2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
4. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
5. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
6. CHAMBERS SHALL BE DESIGNED AND ALLOWABLE LOADS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
7. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
8. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-3500 CHAMBER SYSTEM

1. STORMTECH MC-3500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR AN EXCAVATOR SITUATED OVER THE CHAMBERS.

   STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
4. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
5. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
6. MAINTAIN MINIMUM - 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
7. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
8. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE 3/4-2" (20-50 mm) MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
9. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING..
10. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-3500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-3500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

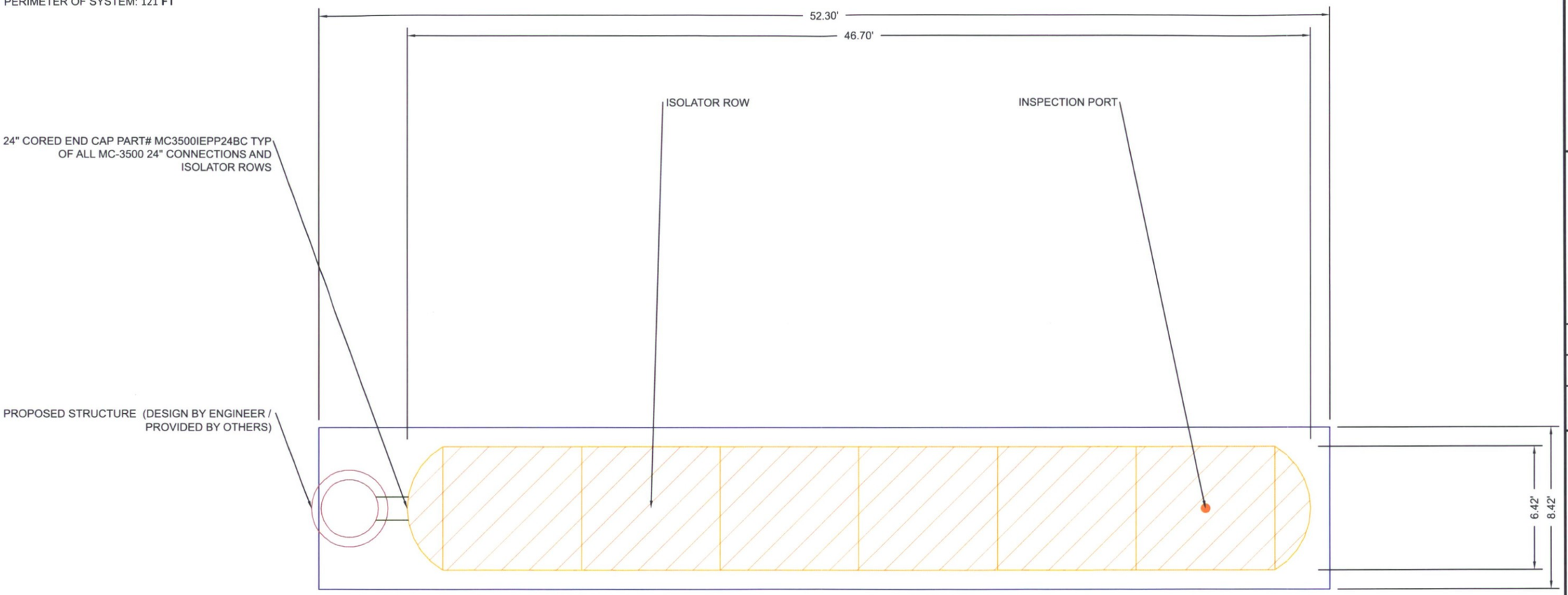
USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

CONCEPTUAL LAYOUT

(6) STORMTECH MC-3500 CHAMBERS
(2) STORMTECH MC-3500 END CAPS
INSTALLED WITH 12 " COVER STONE, 9 " BASE STONE, 40% STONE VOID
INSTALLED SYSTEM VOLUME: 1382 CF
AREA OF SYSTEM: 440 **FT²**
PERIMETER OF SYSTEM: 121 **FT**

COMPUTER GENERATED CONCEPTUAL LAYOUT - NOT FOR CONSTRUCTION



Deer Valley Townhomes at Miller Rd and Deer Vall
Scottsdale, Arizona

REV	DRW	CHK	DESCRIPTION

DATE: 07/06/2018 | DRAWN: BD | PROJECT #: Tool | CHECKED: ---

StormTech®
Detention Retention Water Quality
70 INWOOD ROAD, SUITE 3 | ROCKY HILL | CT | 06067
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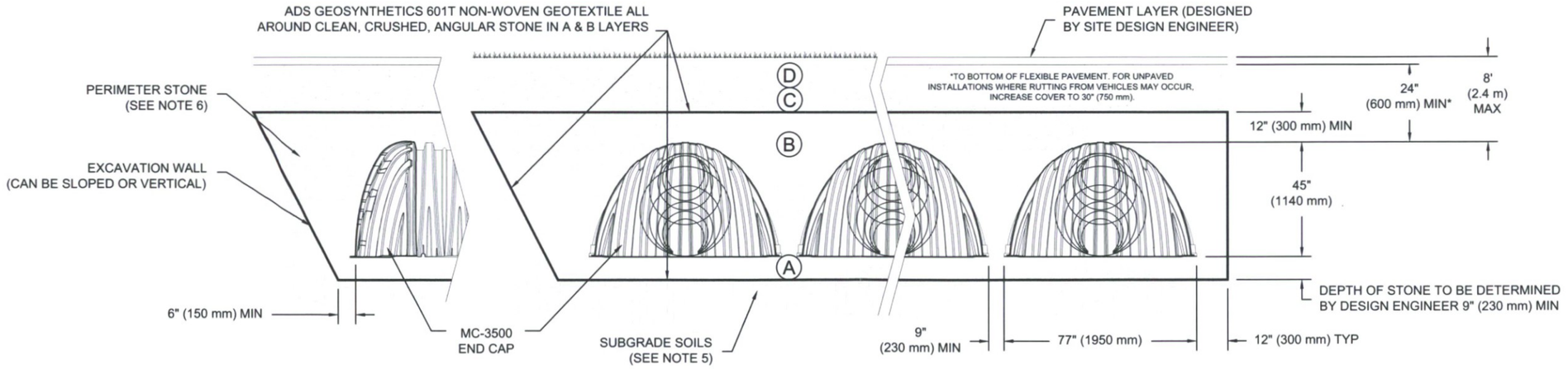
NOT TO SCALE

ACCEPTABLE FILL MATERIALS: STORMTECH MC-3500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	NO COMPACTION REQUIRED.
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE, NOMINAL SIZE DISTRIBUTION BETWEEN 3/4-2 INCH (20-50 mm)	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE. [2] [3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.



NOTES:

1. MC-3500 CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
2. MC-3500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. "ACCEPTABLE FILL MATERIALS" TABLE ABOVE PROVIDES MATERIAL LOCATIONS, DESCRIPTIONS, GRADATIONS, AND COMPACTION REQUIREMENTS FOR FOUNDATION, EMBEDMENT, AND FILL MATERIALS.
4. THE "SITE DESIGN ENGINEER" REFERS TO THE ENGINEER RESPONSIBLE FOR THE DESIGN AND LAYOUT OF THE STORMTECH CHAMBERS FOR THIS PROJECT.
5. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
6. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
7. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.

Deer Valley Townhomes at Miller Rd and Deer Va
Scottsdale, Arizona

DATE: 07/06/2018 | DRAWN: BD | PROJECT #: Tool | CHECKED: ---

REV | DRW | CHK | DESCRIPTION

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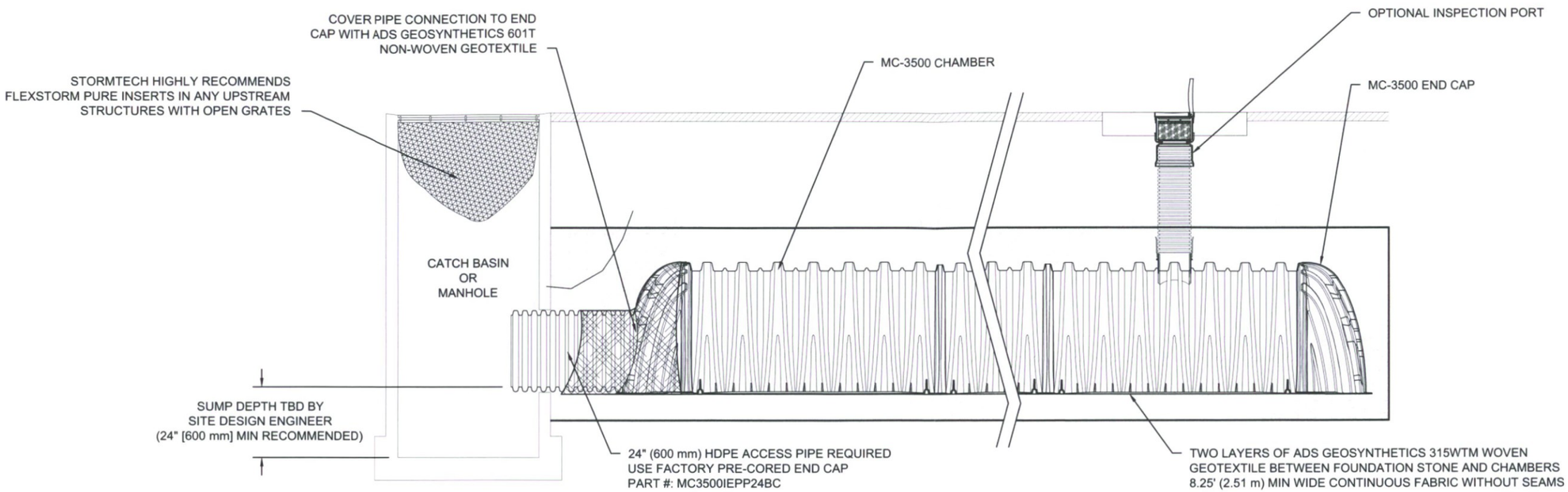


MC-3500 ISOLATOR ROW DETAIL
NTS

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

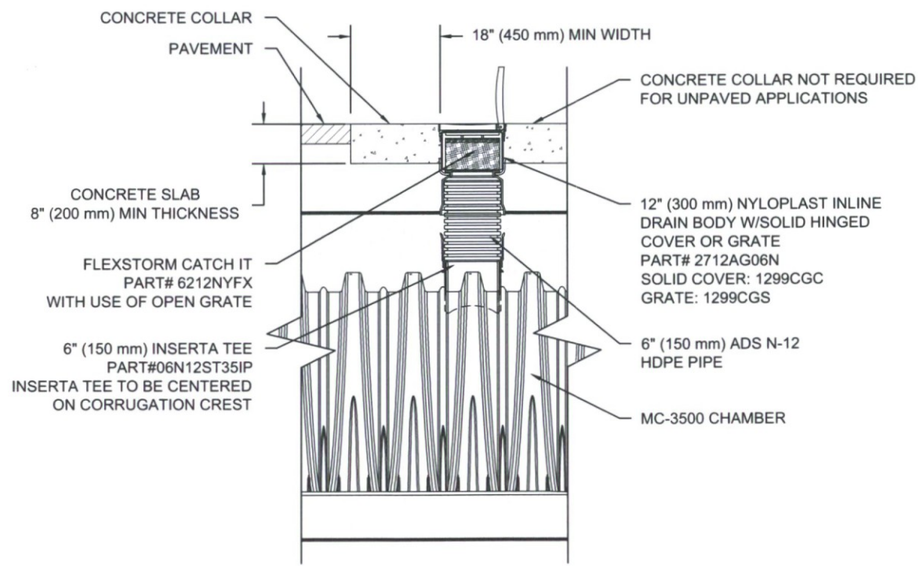
STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.



MC-3500 6" INSPECTION PORT DETAIL
NTS

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Scottsdale, Arizona

REV	DRW	CHK	DESCRIPTION

DATE: 07/06/2018 DRAWN: BD
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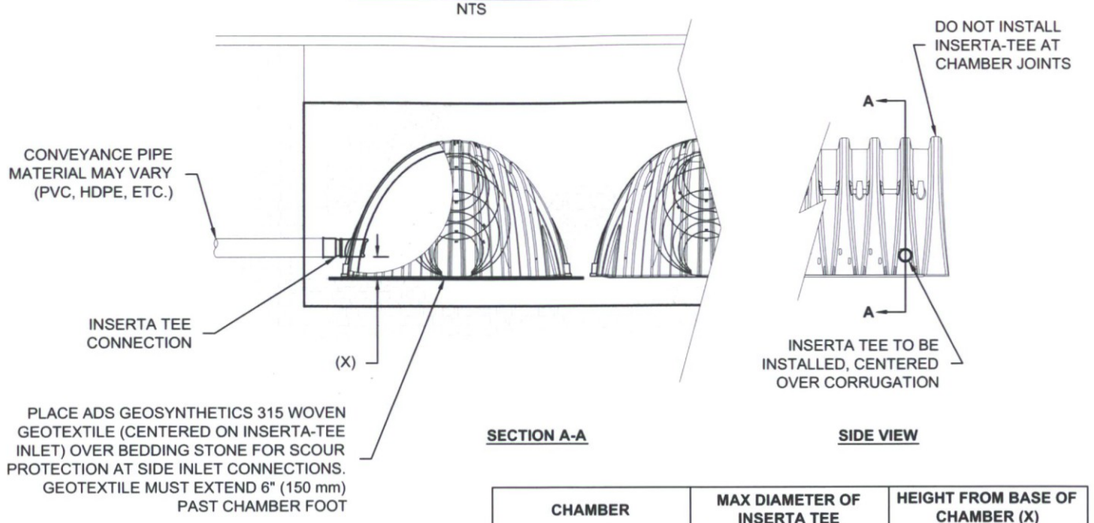
INSERTA TEE DETAIL

NTS



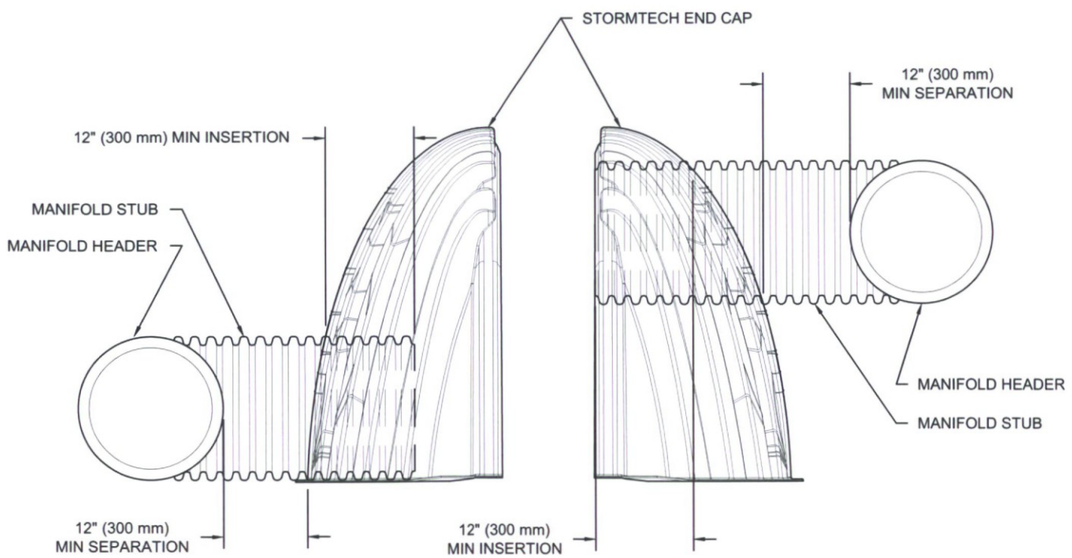
SECTION A-A **SIDE VIEW**

CHAMBER	MAX DIAMETER OF INSERTA TEE	HEIGHT FROM BASE OF CHAMBER (X)
SC-310	6" (150 mm)	4" (100 mm)
SC-740	10" (250 mm)	4" (100 mm)
DC-780	10" (250 mm)	4" (100 mm)
MC-3500	12" (300 mm)	6" (150 mm)
MC-4500	12" (300 mm)	8" (200 mm)
INSERTA TEE FITTINGS AVAILABLE FOR SDR 26, SDR 35, SCH 40 IPS GASKETED & SOLVENT WELD, N-12, HP STORM, C-900 OR DUCTILE IRON		

NOTE:
PART NUMBERS WILL VARY BASED ON INLET PIPE MATERIALS.
CONTACT STORMTECH FOR MORE INFORMATION.

MC-SERIES END CAP INSERTION DETAIL

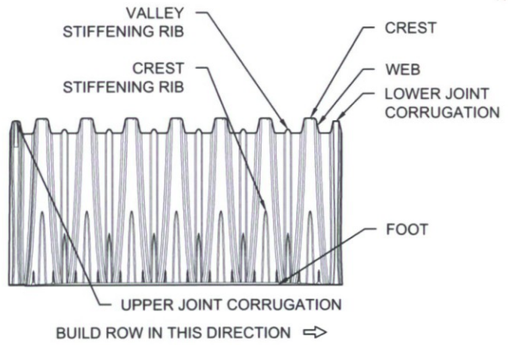
NTS

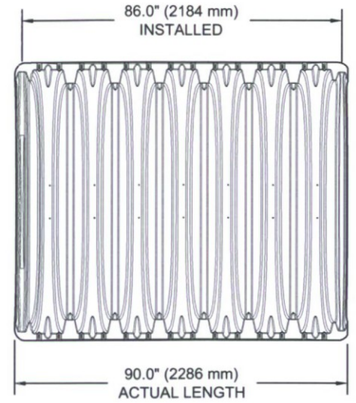


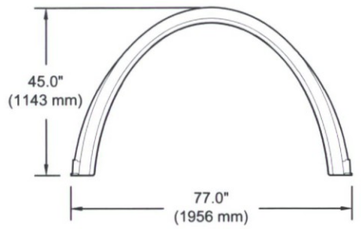
NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

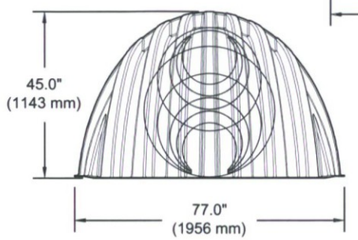
MC-3500 TECHNICAL SPECIFICATION

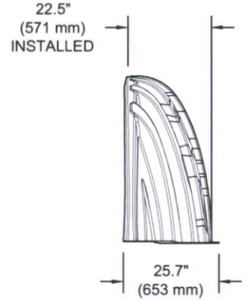
NTS











NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 86.0"	(1956 mm X 1143 mm X 2184 mm)
CHAMBER STORAGE	109.9 CUBIC FEET	(3.11 m³)
MINIMUM INSTALLED STORAGE*	178.9 CUBIC FEET	(5.06 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

NOMINAL END CAP SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	77.0" X 45.0" X 22.5"	(1956 mm X 1143 mm X 571 mm)
END CAP STORAGE	14.9 CUBIC FEET	(0.42 m³)
MINIMUM INSTALLED STORAGE*	46.0 CUBIC FEET	(1.30 m³)
WEIGHT	50.0 lbs.	(22.7 kg)

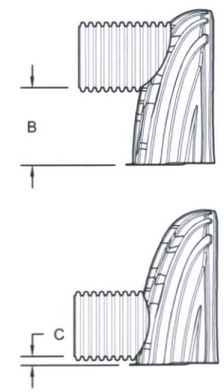
*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"

PART #	STUB	B	C
MC3500IEPP06T	6" (150 mm)	33.21" (844 mm)	---
MC3500IEPP06B		---	0.66" (17 mm)
MC3500IEPP08T	8" (200 mm)	31.16" (791 mm)	---
MC3500IEPP08B		---	0.81" (21 mm)
MC3500IEPP10T	10" (250 mm)	29.04" (738 mm)	---
MC3500IEPP10B		---	0.93" (24 mm)
MC3500IEPP12T	12" (300 mm)	26.36" (670 mm)	---
MC3500IEPP12B		---	1.35" (34 mm)
MC3500IEPP15T	15" (375 mm)	23.39" (594 mm)	---
MC3500IEPP15B		---	1.50" (38 mm)
MC3500IEPP18TC	18" (450 mm)	20.03" (509 mm)	---
MC3500IEPP18BC		---	1.77" (45 mm)
MC3500IEPP24TC	24" (600 mm)	14.48" (368 mm)	---
MC3500IEPP24BC		---	2.06" (52 mm)
MC3500IEPP30BC	30" (750 mm)	---	

NOTE: ALL DIMENSIONS ARE NOMINAL

CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS.
CUSTOM INVERT LOCATIONS ON THE MC-3500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm)
THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHTEST POSSIBLE FOR THE PIPE SIZE.



Deer Valley Townhomes at Miller Rd and Deer Va
Scottsdale, Arizona

DATE: 07/06/2018 DRAWN: BD CHECKED: ---
PROJECT #: Tool

REV	DRW	CHK	DESCRIPTION

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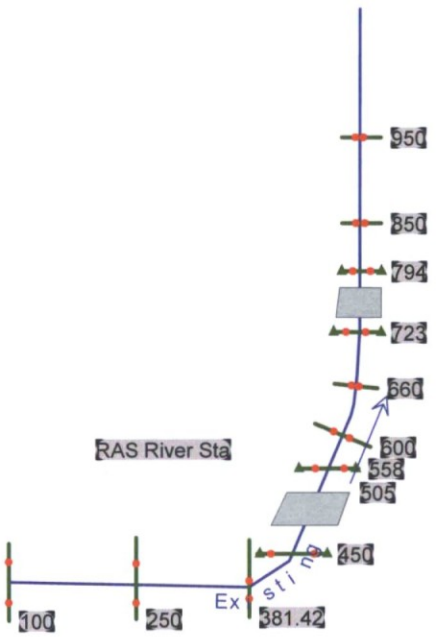
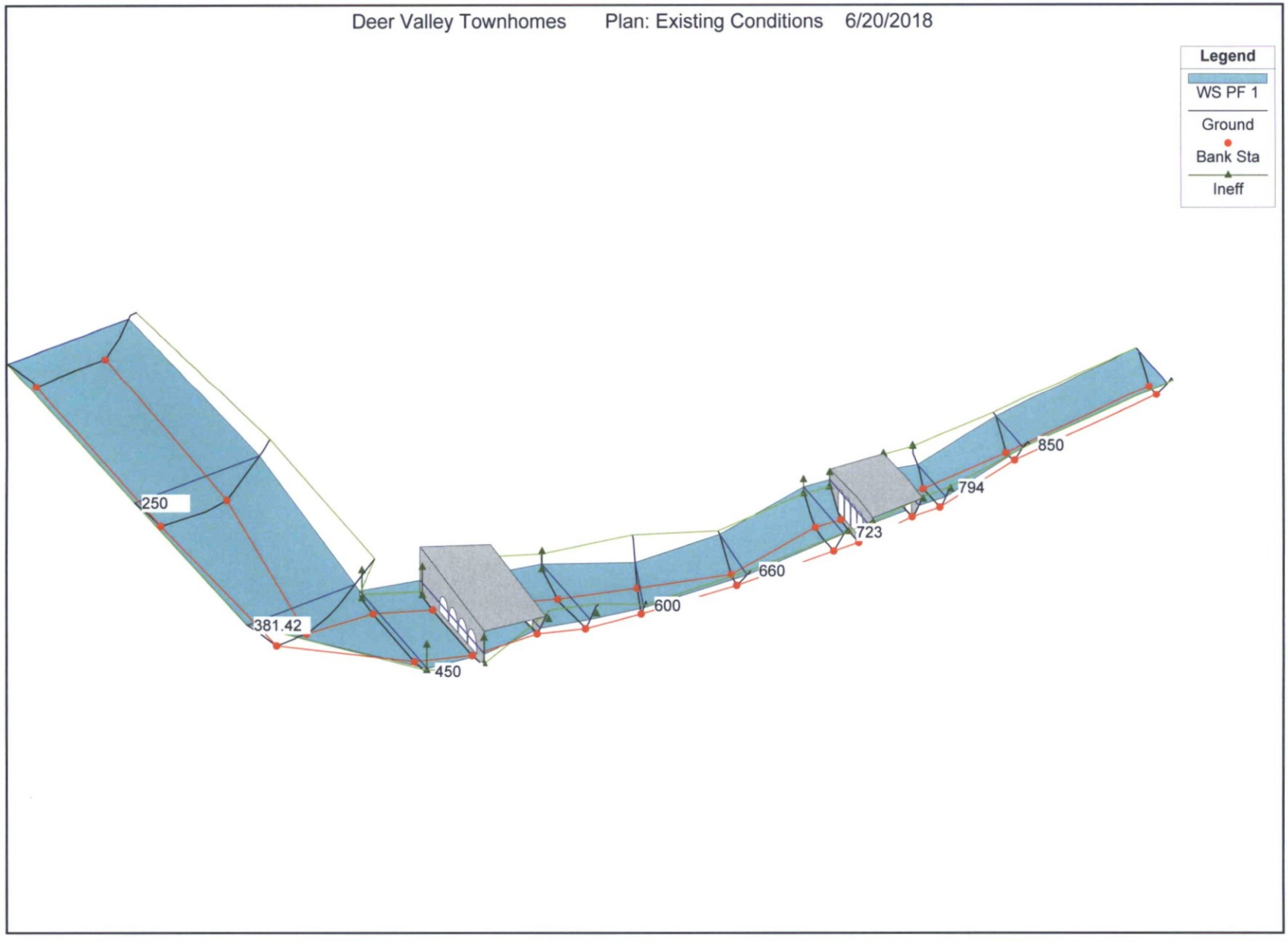
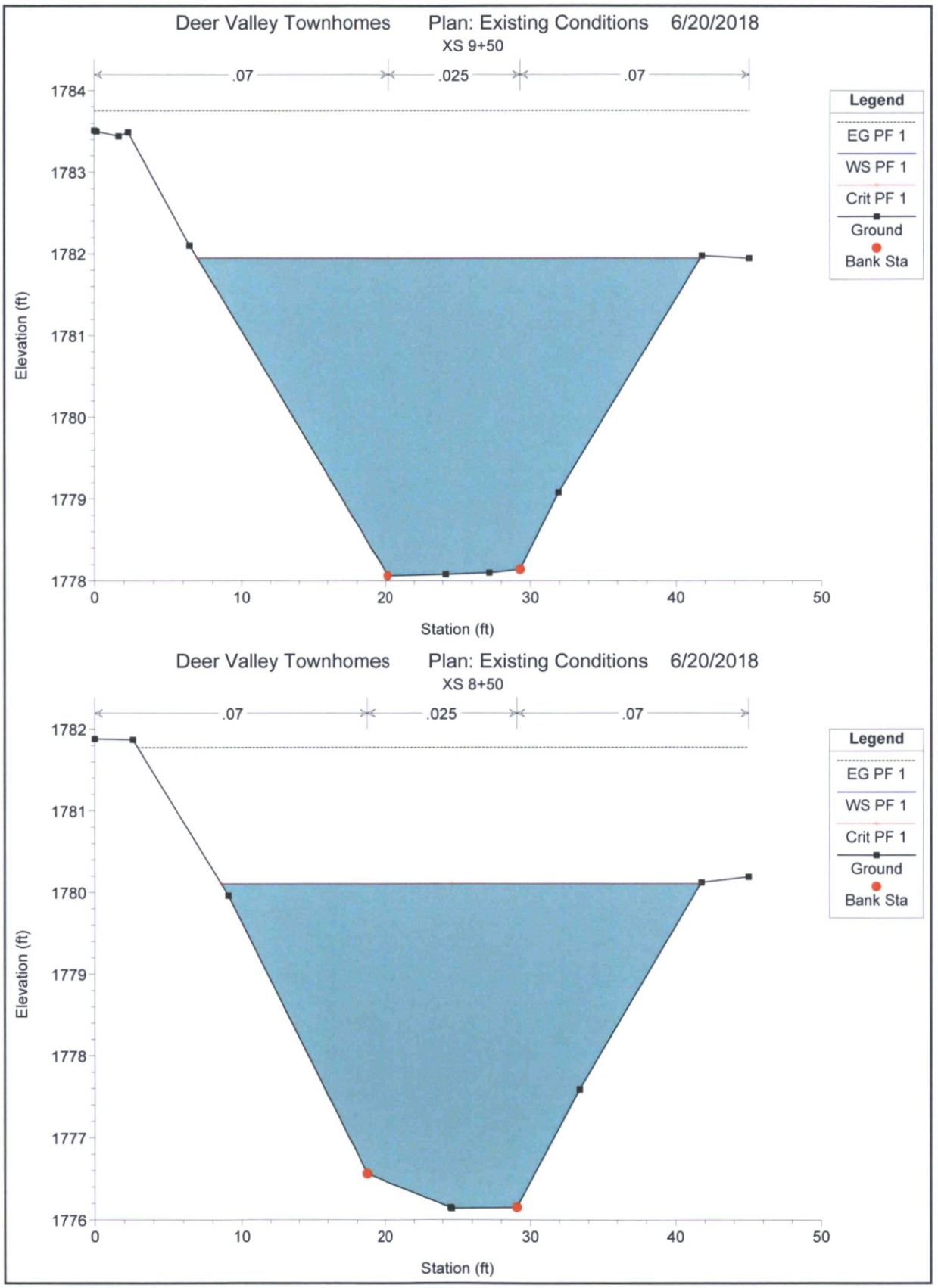
Appendix E

HEC-RAS Output


950
850
794
723
660
RAS River Sta
600
558
505
450
Existing
100
250
381.42


Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
Legend
WS PF 1
Ground
Bank Sta
Ineff
250
381.42
450
600
660
723
794
850


Deer Valley Townhomes
Plan: Existing Conditions
6/20/2018
XS 9+50
.07
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1784
1783
1782
1781
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30
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50
Deer Valley Townhomes
Plan: Existing Conditions
6/20/2018
XS 8+50
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
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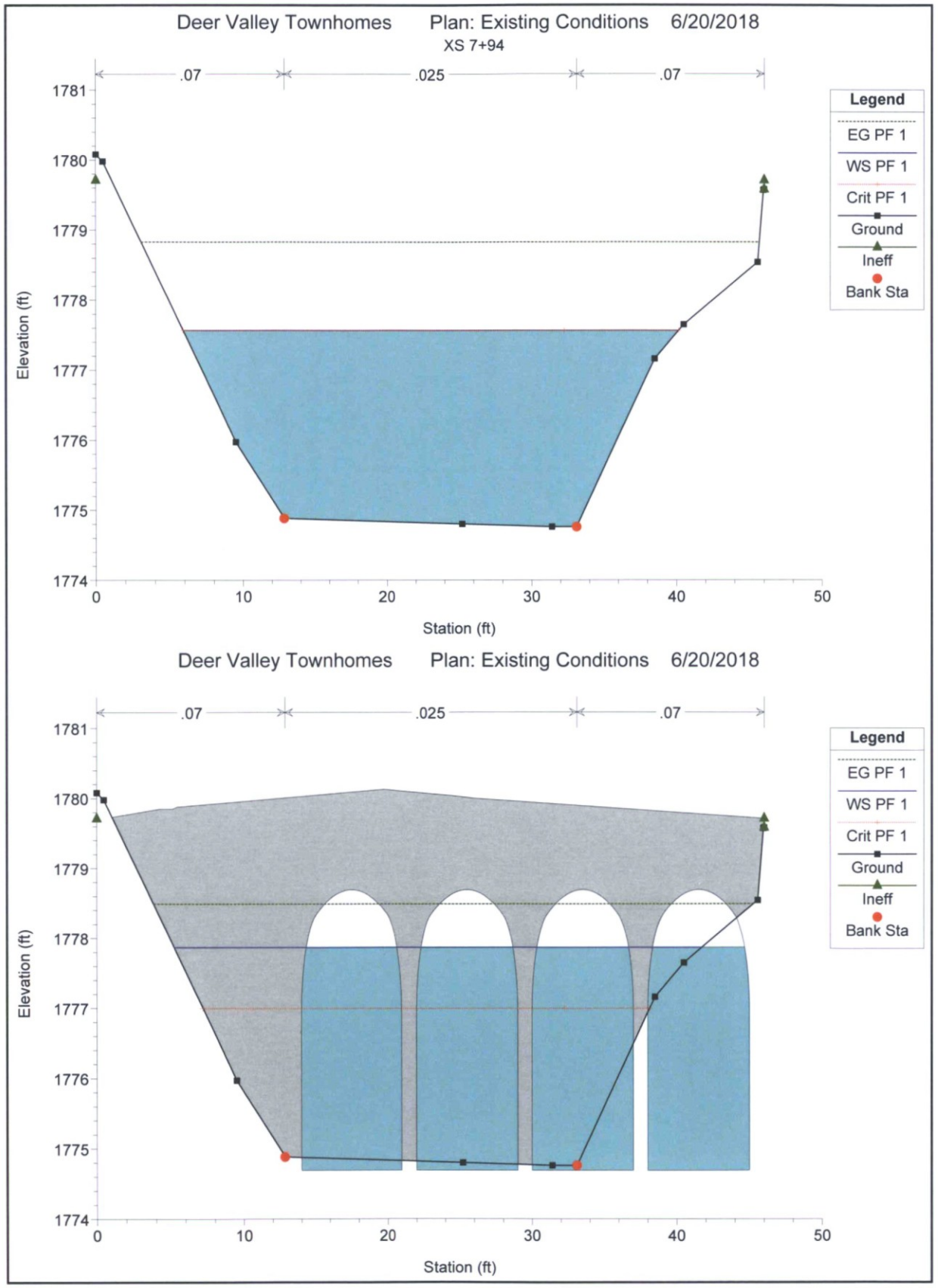
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Elevation (ft)
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Station (ft)
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Crit PF 1
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Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
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Elevation (ft)
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Station (ft)
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WS PF 1
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Ground
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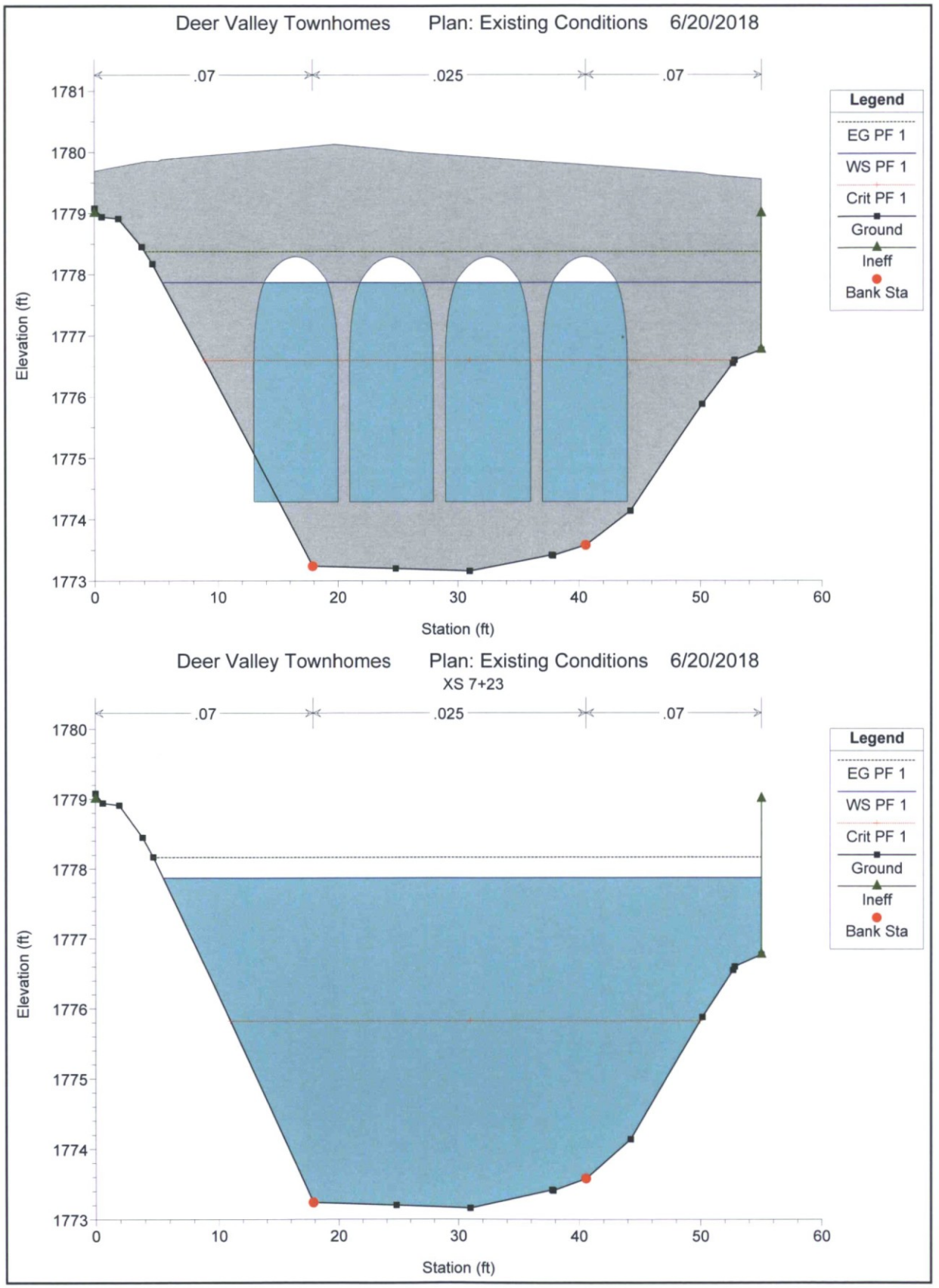
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1773
Elevation (ft)
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40
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Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
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Bank Sta
Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
XS 7+23
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Elevation (ft)
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Station (ft)
Legend
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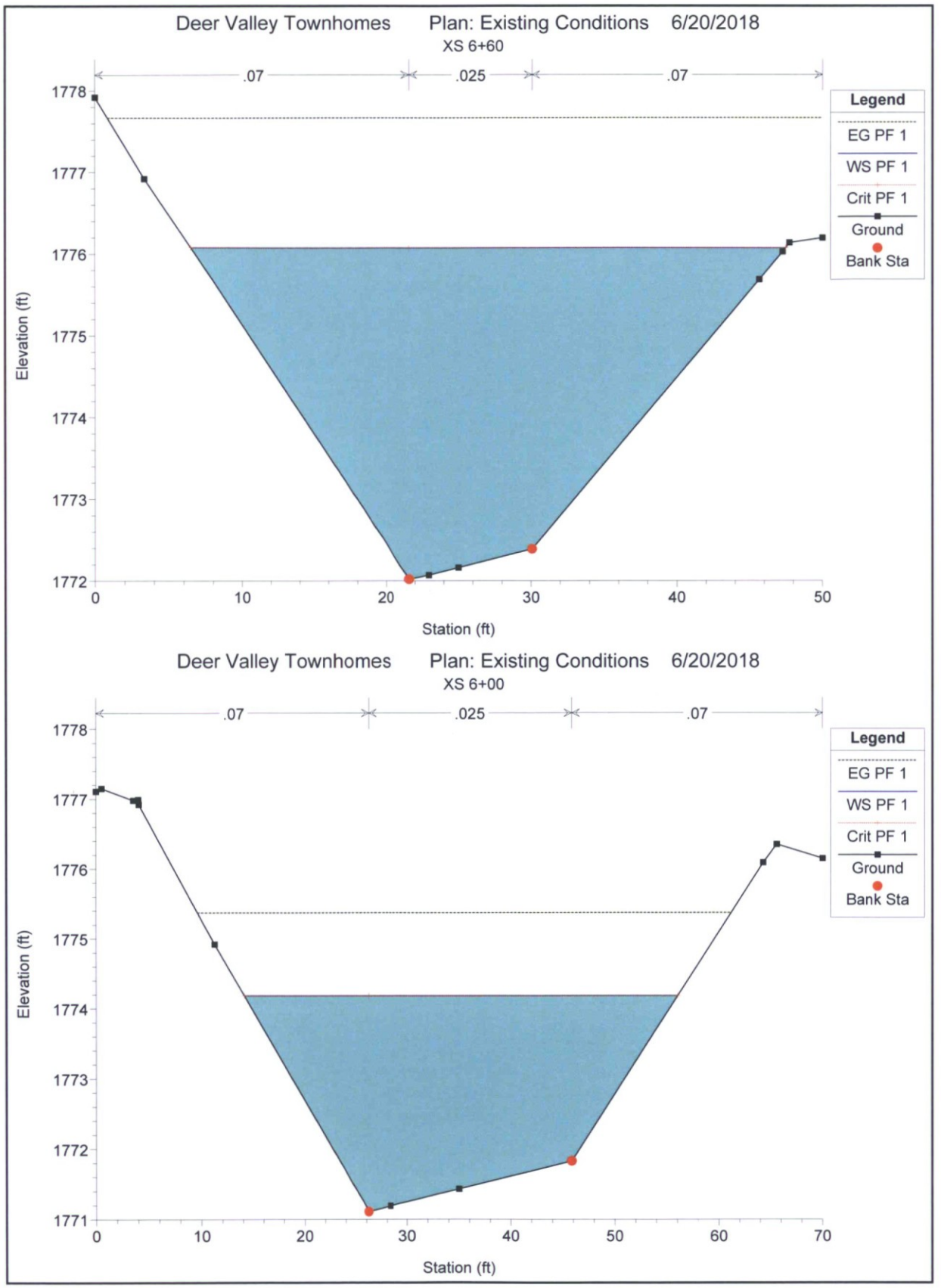
Crit PF 1
Ground
Ineff
Bank Sta


Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
XS 6+60
.07
.025
.07
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
XS 6+00
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.025
.07
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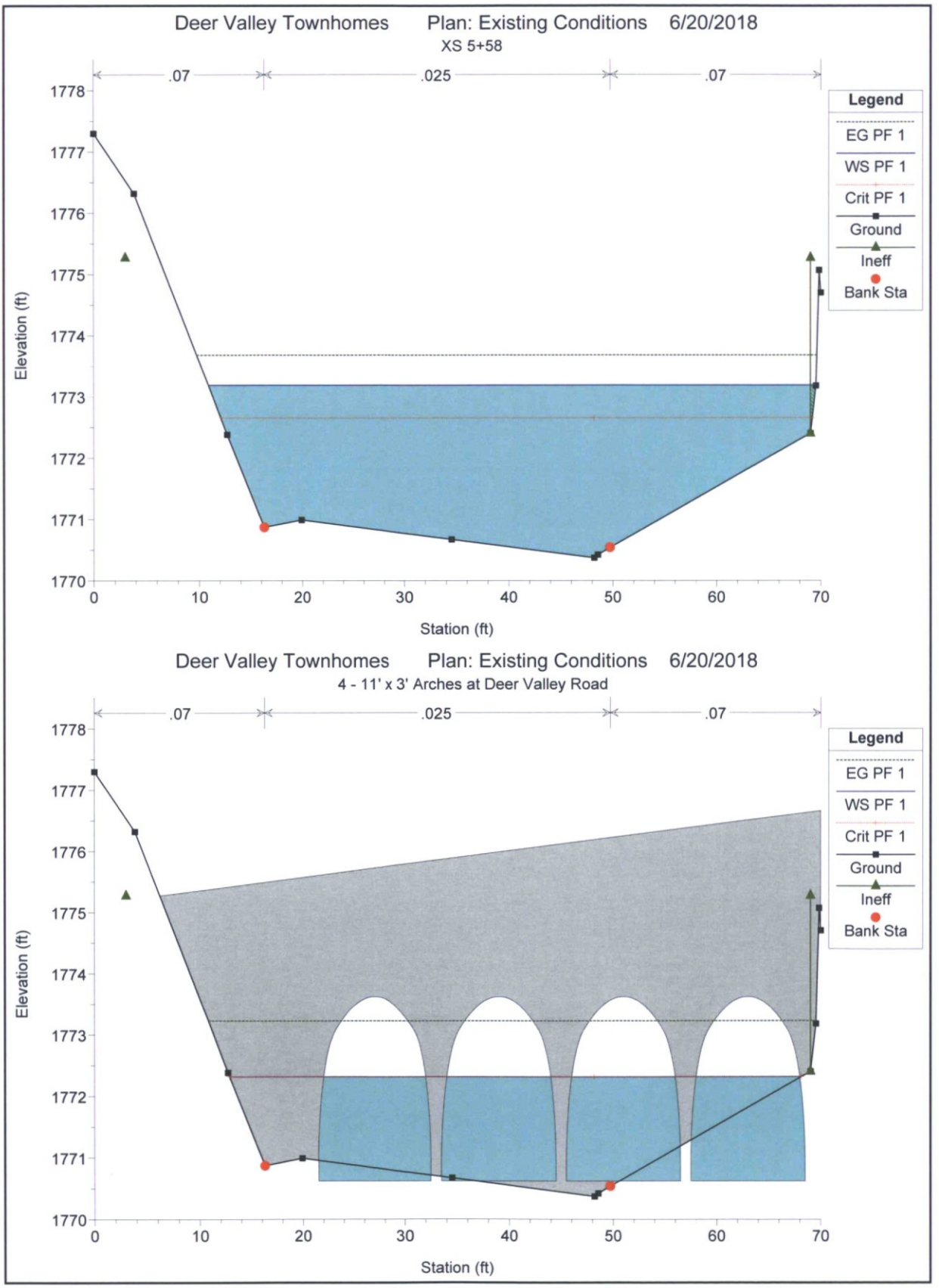
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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XS 5+58
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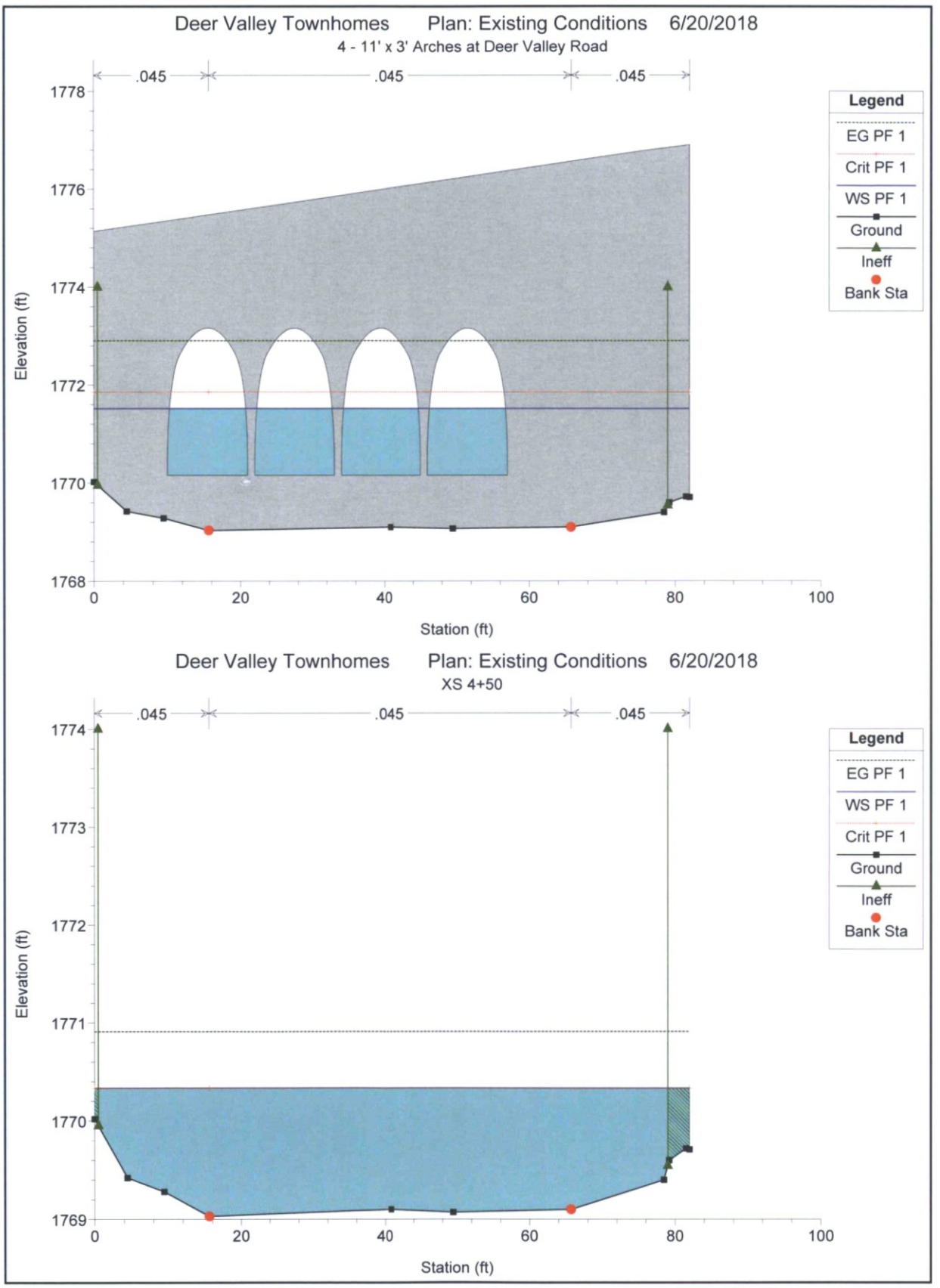
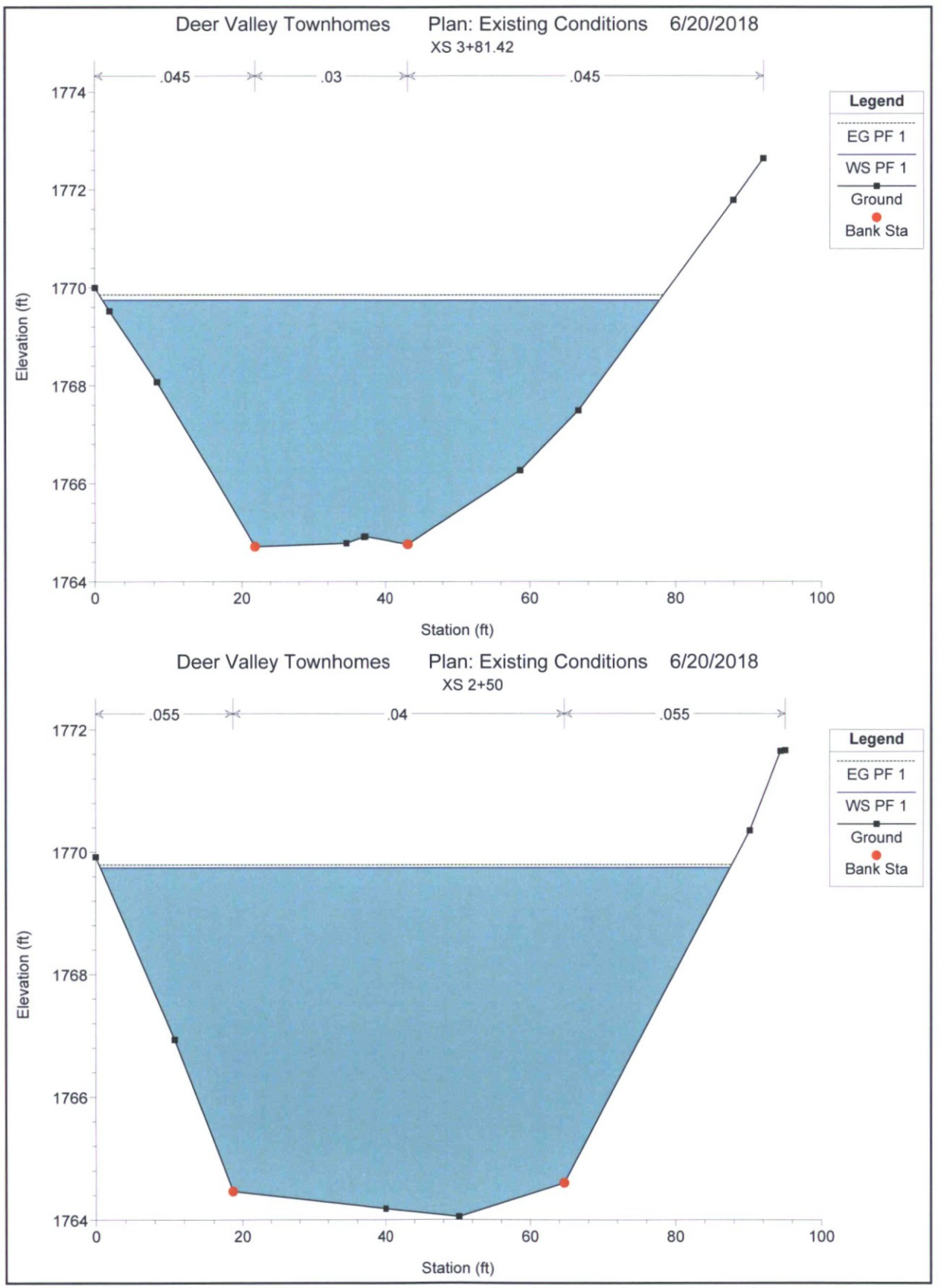
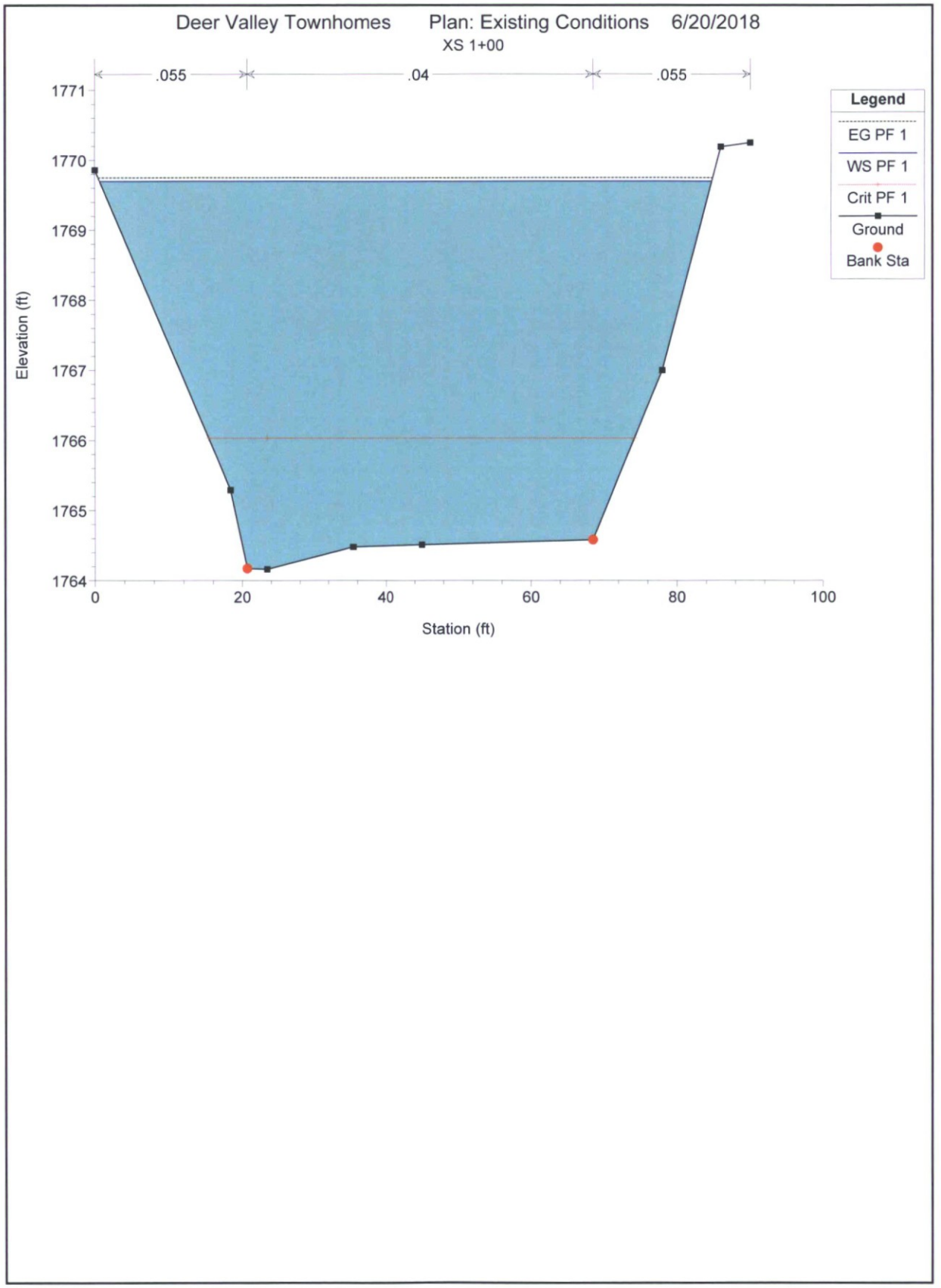
.07
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
1778
1777
1776
1775
1774
1773
1772
1771
1770
0
10
20
30
40
50
60
70
Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
4 - 11' x 3' Arches at Deer Valley Road
.07
.025
.07
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
4 - 11' x 3' Arches at Deer Valley Road
.045
.045
.045
1778
1776
1774
1772
1770
1768
Elevation (ft)
0
20
40
60
80
100
Station (ft)
Legend
EG PF 1
Crit PF 1
WS PF 1
Ground
Ineff
Bank Sta
Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
XS 4+50
.045
.045
.045
1774
1773
1772
1771
1770
1769
Elevation (ft)
0
20
40
60
80
100
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta


Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
XS 3+81.42
.045
.03
.045
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
Deer Valley Townhomes Plan: Existing Conditions 6/20/2018
XS 2+50
.055
.04
.055
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


Deer Valley Townhomes
Plan: Existing Conditions
6/20/2018
XS 1+00
.055
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1771
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1768
1767
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1765
1764
Elevation (ft)
0
20
40
60
80
100
Station (ft)
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta

HEC-RAS Plan: EX COND River: Existing Reach: RAS River Sta Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
RAS River Sta	950	PF 1	557.00	1778.06	1781.95	1781.95	1783.76	0.006950	12.20	83.71	34.73	1.09
RAS River Sta	850	PF 1	557.00	1776.14	1780.11	1780.11	1781.77	0.006141	11.42	82.10	33.14	1.03
RAS River Sta	794	PF 1	557.00	1774.76	1777.57	1777.57	1778.83	0.006384	9.32	74.73	34.23	0.99
RAS River Sta	757		Culvert									
RAS River Sta	723	PF 1	557.00	1773.16	1777.87	1775.82	1778.17	0.000801	4.66	171.75	49.51	0.38
RAS River Sta	660	PF 1	557.00	1772.02	1776.08	1776.08	1777.67	0.006634	11.94	95.62	40.98	1.07
RAS River Sta	600	PF 1	557.00	1771.11	1774.18	1774.18	1775.37	0.006423	9.26	83.85	41.91	0.99
RAS River Sta	558	PF 1	557.00	1770.37	1773.19	1772.66	1773.68	0.002940	5.93	123.01	58.66	0.66
RAS River Sta	505		Culvert									
RAS River Sta	450	PF 1	557.00	1769.03	1770.33	1770.33	1770.91	0.026927	6.31	92.00	82.00	0.99
RAS River Sta	381.42	PF 1	557.00	1764.71	1769.75		1769.86	0.000495	3.20	258.18	76.76	0.25
RAS River Sta	250	PF 1	557.00	1764.05	1769.74		1769.79	0.000265	1.88	356.65	86.83	0.14
RAS River Sta	100	PF 1	557.00	1764.16	1769.70	1766.03	1769.75	0.000285	1.89	347.50	84.08	0.15

Plan: EX COND Existing RAS River Sta RS: 950 Profile: PF 1

E.G. Elev (ft)	1783.76	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.80	Wt. n-Val.	0.070	0.025	0.070
W.S. Elev (ft)	1781.95	Reach Len. (ft)	100.00	100.00	100.00
Crit W.S. (ft)	1781.95	Flow Area (sq ft)	25.70	35.18	22.83
E.G. Slope (ft/ft)	0.006950	Area (sq ft)	25.70	35.18	22.83
Q Total (cfs)	557.00	Flow (cfs)	68.92	429.12	58.96
Top Width (ft)	34.73	Top Width (ft)	13.21	9.11	12.41
Vel Total (ft/s)	6.65	Avg. Vel. (ft/s)	2.68	12.20	2.58
Max Chl Dpth (ft)	3.89	Hydr. Depth (ft)	1.95	3.86	1.84
Conv. Total (cfs)	6681.5	Conv. (cfs)	826.7	5147.5	707.2
Length Wtd. (ft)	100.00	Wetted Per. (ft)	13.77	9.11	12.98
Min Ch El (ft)	1778.06	Shear (lb/sq ft)	0.81	1.68	0.76
Alpha	2.62	Stream Power (lb/ft s)	2.17	20.44	1.97
Frctn Loss (ft)	0.65	Cum Volume (acre-ft)	0.52	2.05	0.69
C & E Loss (ft)	0.04	Cum SA (acres)	0.28	0.57	0.35

Plan: EX COND Existing RAS River Sta RS: 850 Profile: PF 1

E.G. Elev (ft)	1781.77	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.67	Wt. n-Val.	0.070	0.025	0.070
W.S. Elev (ft)	1780.11	Reach Len. (ft)	56.00	56.00	56.00
Crit W.S. (ft)	1780.11	Flow Area (sq ft)	17.87	39.78	24.45
E.G. Slope (ft/ft)	0.006141	Area (sq ft)	17.87	39.78	24.45
Q Total (cfs)	557.00	Flow (cfs)	41.68	454.08	61.24
Top Width (ft)	33.14	Top Width (ft)	10.15	10.35	12.63
Vel Total (ft/s)	6.78	Avg. Vel. (ft/s)	2.33	11.42	2.50
Max Chl Dpth (ft)	3.97	Hydr. Depth (ft)	1.76	3.84	1.94
Conv. Total (cfs)	7108.0	Conv. (cfs)	531.9	5794.6	781.5
Length Wtd. (ft)	56.00	Wetted Per. (ft)	10.76	10.37	13.24
Min Ch El (ft)	1776.14	Shear (lb/sq ft)	0.64	1.47	0.71
Alpha	2.33	Stream Power (lb/ft s)	1.49	16.79	1.77
Frctn Loss (ft)	0.35	Cum Volume (acre-ft)	0.47	1.97	0.64
C & E Loss (ft)	0.12	Cum SA (acres)	0.25	0.55	0.32

Plan: EX COND Existing RAS River Sta RS: 794 Profile: PF 1

E.G. Elev (ft)	1778.83	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.26	Wt. n-Val.	0.070	0.025	0.070
W.S. Elev (ft)	1777.57	Reach Len. (ft)	71.00	71.00	71.00
Crit W.S. (ft)	1777.57	Flow Area (sq ft)	10.07	55.69	8.97
E.G. Slope (ft/ft)	0.006384	Area (sq ft)	10.07	55.69	8.97
Q Total (cfs)	557.00	Flow (cfs)	20.86	519.13	17.01
Top Width (ft)	34.23	Top Width (ft)	6.96	20.25	7.02
Vel Total (ft/s)	7.45	Avg. Vel. (ft/s)	2.07	9.32	1.90
Max Chl Dpth (ft)	2.81	Hydr. Depth (ft)	1.45	2.75	1.28
Conv. Total (cfs)	6971.1	Conv. (cfs)	261.0	6497.2	212.9
Length Wtd. (ft)	71.00	Wetted Per. (ft)	7.47	20.25	7.59
Min Ch El (ft)	1774.76	Shear (lb/sq ft)	0.54	1.10	0.47
Alpha	1.46	Stream Power (lb/ft s)	1.11	10.22	0.89
Frctn Loss (ft)		Cum Volume (acre-ft)	0.46	1.91	0.62
C & E Loss (ft)		Cum SA (acres)	0.24	0.53	0.31

Plan: EX COND Existing RAS River Sta RS: 723 Profile: PF 1

E.G. Elev (ft)	1778.17	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.30	Wt. n-Val.	0.070	0.025	0.070
W.S. Elev (ft)	1777.87	Reach Len. (ft)	63.00	63.00	63.00
Crit W.S. (ft)	1775.82	Flow Area (sq ft)	28.70	104.47	38.58
E.G. Slope (ft/ft)	0.000801	Area (sq ft)	28.70	104.47	38.58
Q Total (cfs)	557.00	Flow (cfs)	28.89	486.32	41.80
Top Width (ft)	49.51	Top Width (ft)	12.40	22.68	14.43
Vel Total (ft/s)	3.24	Avg. Vel. (ft/s)	1.01	4.66	1.08
Max Chl Dpth (ft)	4.71	Hydr. Depth (ft)	2.32	4.61	2.67
Conv. Total (cfs)	19681.9	Conv. (cfs)	1020.7	17184.2	1476.9
Length Wtd. (ft)	63.00	Wetted Per. (ft)	13.23	22.69	15.93
Min Ch El (ft)	1773.16	Shear (lb/sq ft)	0.11	0.23	0.12
Alpha	1.81	Stream Power (lb/ft s)	0.11	1.07	0.13
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.46	1.85	0.62
C & E Loss (ft)	0.39	Cum SA (acres)	0.23	0.49	0.29

Plan: EX COND Existing RAS River Sta RS: 660 Profile: PF 1

E.G. Elev (ft)	1777.67	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.59	Wt. n-Val.	0.070	0.025	0.070
W.S. Elev (ft)	1776.08	Reach Len. (ft)	60.00	60.00	60.00
Crit W.S. (ft)	1776.08	Flow Area (sq ft)	30.73	32.77	32.12
E.G. Slope (ft/ft)	0.006634	Area (sq ft)	30.73	32.77	32.12
Q Total (cfs)	557.00	Flow (cfs)	83.21	391.42	82.37
Top Width (ft)	40.98	Top Width (ft)	15.14	8.45	17.39
Vel Total (ft/s)	5.83	Avg. Vel. (ft/s)	2.71	11.94	2.56
Max Chl Dpth (ft)	4.06	Hydr. Depth (ft)	2.03	3.88	1.85
Conv. Total (cfs)	6838.4	Conv. (cfs)	1021.5	4805.5	1011.3
Length Wtd. (ft)	60.00	Wetted Per. (ft)	15.68	8.46	17.78
Min Ch El (ft)	1772.02	Shear (lb/sq ft)	0.81	1.60	0.75
Alpha	3.01	Stream Power (lb/ft s)	2.20	19.17	1.92
Frctn Loss (ft)	0.39	Cum Volume (acre-ft)	0.41	1.75	0.57
C & E Loss (ft)	0.12	Cum SA (acres)	0.21	0.47	0.27

Plan: EX COND Existing RAS River Sta RS: 600 Profile: PF 1

E.G. Elev (ft)	1775.37	Element	Left OB	Channel	Right OB
Vel Head (ft)	1.19	Wt. n-Val.	0.070	0.025	0.070
W.S. Elev (ft)	1774.18	Reach Len. (ft)	42.00	42.00	42.00
Crit W.S. (ft)	1774.18	Flow Area (sq ft)	18.62	53.27	11.96
E.G. Slope (ft/ft)	0.006423	Area (sq ft)	18.62	53.27	11.96
Q Total (cfs)	557.00	Flow (cfs)	41.32	493.39	22.29
Top Width (ft)	41.91	Top Width (ft)	12.12	19.63	10.17
Vel Total (ft/s)	6.64	Avg. Vel. (ft/s)	2.22	9.26	1.86
Max Chl Dpth (ft)	3.07	Hydr. Depth (ft)	1.54	2.71	1.18
Conv. Total (cfs)	6950.0	Conv. (cfs)	515.5	6156.4	278.1
Length Wtd. (ft)	42.00	Wetted Per. (ft)	12.50	19.64	10.43
Min Ch El (ft)	1771.11	Shear (lb/sq ft)	0.60	1.09	0.46
Alpha	1.73	Stream Power (lb/ft s)	1.33	10.07	0.86
Frctn Loss (ft)	0.18	Cum Volume (acre-ft)	0.38	1.69	0.54
C & E Loss (ft)	0.21	Cum SA (acres)	0.19	0.45	0.25

Plan: EX COND Existing RAS River Sta RS: 558 Profile: PF 1

E.G. Elev (ft)	1773.68	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.49	Wt. n-Val.	0.070	0.025	0.070
W.S. Elev (ft)	1773.19	Reach Len. (ft)	108.00	108.00	108.00
Crit W.S. (ft)	1772.66	Flow Area (sq ft)	6.38	83.47	33.16
E.G. Slope (ft/ft)	0.002940	Area (sq ft)	6.38	83.47	33.38
Q Total (cfs)	557.00	Flow (cfs)	7.74	494.60	54.67
Top Width (ft)	58.66	Top Width (ft)	5.42	33.46	19.78
Vel Total (ft/s)	4.53	Avg. Vel. (ft/s)	1.21	5.93	1.65
Max Chl Dpth (ft)	2.82	Hydr. Depth (ft)	1.18	2.49	1.72
Conv. Total (cfs)	10273.0	Conv. (cfs)	142.7	9122.1	1008.3
Length Wtd. (ft)	108.00	Wetted Per. (ft)	5.90	33.48	19.34
Min Ch El (ft)	1770.37	Shear (lb/sq ft)	0.20	0.46	0.31
Alpha	1.53	Stream Power (lb/ft s)	0.24	2.71	0.52
Frctn Loss (ft)		Cum Volume (acre-ft)	0.37	1.62	0.51
C & E Loss (ft)		Cum SA (acres)	0.18	0.42	0.24

Plan: EX COND Existing RAS River Sta RS: 450 Profile: PF 1

E.G. Elev (ft)	1770.91	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.58	Wt. n-Val.	0.045	0.045	0.045
W.S. Elev (ft)	1770.33	Reach Len. (ft)	68.58	68.58	68.58
Crit W.S. (ft)	1770.33	Flow Area (sq ft)	14.67	63.09	14.24
E.G. Slope (ft/ft)	0.026927	Area (sq ft)	14.84	63.09	16.25
Q Total (cfs)	557.00	Flow (cfs)	77.94	398.27	80.79
Top Width (ft)	82.00	Top Width (ft)	15.57	50.17	16.26
Vel Total (ft/s)	6.05	Avg. Vel. (ft/s)	5.31	6.31	5.67
Max Chl Dpth (ft)	1.30	Hydr. Depth (ft)	0.97	1.26	1.07
Conv. Total (cfs)	3394.4	Conv. (cfs)	475.0	2427.1	492.4
Length Wtd. (ft)	68.58	Wetted Per. (ft)	15.11	50.17	13.28
Min Ch El (ft)	1769.03	Shear (lb/sq ft)	1.63	2.11	1.80
Alpha	1.01	Stream Power (lb/ft s)	8.67	13.34	10.22
Frctn Loss (ft)	0.11	Cum Volume (acre-ft)	0.37	1.54	0.51
C & E Loss (ft)	0.02	Cum SA (acres)	0.15	0.32	0.19

Plan: EX COND Existing RAS River Sta RS: 381.42 Profile: PF 1

E.G. Elev (ft)	1769.86	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.11	Wt. n-Val.	0.045	0.030	0.045
W.S. Elev (ft)	1769.75	Reach Len. (ft)	131.42	131.42	131.42
Crit W.S. (ft)		Flow Area (sq ft)	51.28	105.87	101.04
E.G. Slope (ft/ft)	0.000495	Area (sq ft)	51.28	105.87	101.04
Q Total (cfs)	557.00	Flow (cfs)	67.45	339.17	150.38
Top Width (ft)	76.76	Top Width (ft)	20.79	21.34	34.63
Vel Total (ft/s)	2.16	Avg. Vel. (ft/s)	1.32	3.20	1.49
Max Chl Dpth (ft)	5.04	Hydr. Depth (ft)	2.47	4.96	2.92
Conv. Total (cfs)	25044.7	Conv. (cfs)	3032.6	15250.4	6761.7
Length Wtd. (ft)	131.42	Wetted Per. (ft)	21.39	21.35	35.02
Min Ch El (ft)	1764.71	Shear (lb/sq ft)	0.07	0.15	0.09
Alpha	1.52	Stream Power (lb/ft s)	0.10	0.49	0.13
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	0.31	1.40	0.42
C & E Loss (ft)	0.02	Cum SA (acres)	0.12	0.26	0.15

Plan: EX COND Existing RAS River Sta RS: 250 Profile: PF 1

E.G. Elev (ft)	1769.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.055	0.040	0.055
W.S. Elev (ft)	1769.74	Reach Len. (ft)	150.00	150.00	150.00
Crit W.S. (ft)		Flow Area (sq ft)	46.48	251.72	58.45
E.G. Slope (ft/ft)	0.000265	Area (sq ft)	46.48	251.72	58.45
Q Total (cfs)	557.00	Flow (cfs)	37.36	472.19	47.45
Top Width (ft)	86.83	Top Width (ft)	18.04	46.05	22.73
Vel Total (ft/s)	1.56	Avg. Vel. (ft/s)	0.80	1.88	0.81
Max Chl Dpth (ft)	5.69	Hydr. Depth (ft)	2.58	5.47	2.57
Conv. Total (cfs)	34220.9	Conv. (cfs)	2295.5	29010.3	2915.1
Length Wtd. (ft)	150.00	Wetted Per. (ft)	18.80	46.06	23.31
Min Ch El (ft)	1764.05	Shear (lb/sq ft)	0.04	0.09	0.04
Alpha	1.26	Stream Power (lb/ft s)	0.03	0.17	0.03
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	0.17	0.86	0.18
C & E Loss (ft)	0.00	Cum SA (acres)	0.07	0.16	0.07

Plan: EX COND Existing RAS River Sta RS: 100 Profile: PF 1

E.G. Elev (ft)	1769.75	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.05	Wt. n-Val.	0.055	0.040	0.055
W.S. Elev (ft)	1769.70	Reach Len. (ft)			
Crit W.S. (ft)	1766.03	Flow Area (sq ft)	50.67	250.58	46.25
E.G. Slope (ft/ft)	0.000285	Area (sq ft)	50.67	250.58	46.25
Q Total (cfs)	557.00	Flow (cfs)	41.79	474.22	41.00
Top Width (ft)	84.08	Top Width (ft)	20.05	47.79	16.25
Vel Total (ft/s)	1.60	Avg. Vel. (ft/s)	0.82	1.89	0.89
Max Chl Dpth (ft)	5.54	Hydr. Depth (ft)	2.53	5.24	2.85
Conv. Total (cfs)	32996.4	Conv. (cfs)	2475.3	28092.5	2428.6
Length Wtd. (ft)		Wetted Per. (ft)	20.84	47.79	17.07
Min Ch El (ft)	1764.16	Shear (lb/sq ft)	0.04	0.09	0.05
Alpha	1.23	Stream Power (lb/ft s)	0.04	0.18	0.04
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Plan: EX COND Existing RAS River Sta RS: 757 Culv Group: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	557.00	Culv Full Len (ft)	
# Barrels	4	Culv Vel US (ft/s)	6.32
Q Barrel (cfs)	139.25	Culv Vel DS (ft/s)	5.70
E.G. US. (ft)	1778.80	Culv Inv El Up (ft)	1774.69
W.S. US. (ft)	1777.57	Culv Inv El Dn (ft)	1774.29
E.G. DS (ft)	1778.17	Culv Frctn Ls (ft)	0.11
W.S. DS (ft)	1777.87	Culv Exit Loss (ft)	0.21
Delta EG (ft)	0.63	Culv Entr Loss (ft)	0.31
Delta WS (ft)	0.31	Q Weir (cfs)	
E.G. IC (ft)	1778.56	Weir Sta Lft (ft)	
E.G. OC (ft)	1778.80	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1777.87	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1777.87	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	2.18	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	2.31	Min El Weir Flow (ft)	1779.72

Plan: EX COND Existing RAS River Sta RS: 505 Culv Group: Culvert #1 Profile: PF 1

Q Culv Group (cfs)	557.00	Culv Full Len (ft)	
# Barrels	4	Culv Vel US (ft/s)	7.66
Q Barrel (cfs)	139.25	Culv Vel DS (ft/s)	9.43
E.G. US. (ft)	1773.68	Culv Inv El Up (ft)	1770.62
W.S. US. (ft)	1773.19	Culv Inv El Dn (ft)	1770.16
E.G. DS (ft)	1770.91	Culv Frctn Ls (ft)	0.32
W.S. DS (ft)	1770.33	Culv Exit Loss (ft)	2.00
Delta EG (ft)	2.78	Culv Entr Loss (ft)	0.46
Delta WS (ft)	2.86	Q Weir (cfs)	
E.G. IC (ft)	1773.39	Weir Sta Lft (ft)	
E.G. OC (ft)	1773.68	Weir Sta Rgt (ft)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (ft)	1772.32	Weir Max Depth (ft)	
Culv WS Outlet (ft)	1771.52	Weir Avg Depth (ft)	
Culv Nml Depth (ft)	1.27	Weir Flow Area (sq ft)	
Culv Crt Depth (ft)	1.70	Min El Weir Flow (ft)	1775.28

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Preliminary Basis of Design Report

Water

Deer Valley Townhomes

NWC of Miller Road & Deer Valley Road

City of Scottsdale

Maricopa County, Arizona

TSC Project No. 0800

August 27, 2018

Prepared for:

Beardsley 22, Inc
222 W Linger Lane,
Phoenix, AZ 85021

consulting Terrascape

civil engineering • surveying • urban planning

Table of Contents

List of Figures

List of Appendices

1.0 Introduction

The proposed Deer Valley Townhomes development (Project) consists of attached townhomes split between three (3) buildings on a one acre parcel. The Site is defined by the parcel boundary for APN# 212-02-010E and is located at the northwest corner of Miller Road and Deer Valley Road in Scottsdale (see figure 1 below). The current project zoning is PCOC and proposed project zoning is R-3. The site is currently undeveloped and the proposed development will be constructed all at once and will not be phased.

The purpose of this report is to evaluate the Site's existing and proposed water and fire infrastructure to determine if adequate supply is available. This report takes into consideration the projected water demand, fire demand, and its impact. The Project will be designed and developed in accordance with the City of Scottsdale amendment to the 2015 International Fire Code, 2018 City of Scottsdale Design Standards & Policies Manual (DSPM), County, and State requirements.

Figure 1: Location Map

2.0 Water System

The Site is a vacant lot with a channel along the east side. There are existing water lines in Deer Valley Road and Miller Road. City quarter section maps show various water lines along Miller Road that continue west on Deer Valley Road, which may be raw water or transmission mains but do not negatively impact the Site. There

appears to be a water tank on the south side of Deer Valley Road. An 8" D.I.P. water line exists in Calistoga Circle within the Arizona Silverado subdivision. This line is located at the northwest corner of the Site with a service line that extends to the site with a blowoff at the end of the line.

A water meter is proposed at the northwest corner of the property within the existing City utility and drainage easement shown on the Arizona Silverado Final Plat. The meter size is estimated at 1-½", but will need to be confirmed during the construction document phase. A 1-½" domestic water line is estimated at this time to service the Site, with individual connections to each home. During final design, it may be determined that each structure requires one domestic service not one per home. Considering the residual pressure of 96 psi along Deer Valley Road, a pressure reducing valve may be required for the domestic supply. See **Appendix A** for flow test results.

3.0 Domestic Water Demand Calculations

Unit Count = 9

Average Day Flow (ADF) =9 x 227.6 gpd/unit = 2,048.4 gpd =
2,048.4gpd/1440(min/day) = 1.42 gpm

Maximum Day Flow (MDF) =ADF x 2.0 = 1.42 gpm x 2.0 = 2.84 gpm

Peak Hour Flow (PHF) =ADF x 3.5 = 1.42 gpm x 3.5 = 4.97 gpm

*ADF based on DSPM figure 6-1.2
*MDF and PHF based on DSPM section 6-1.404.B

4.0 Fire Flow Calculations

The Project falls within the City of Scottsdale service boundary in Pressure Zone 6. There is an existing hydrant south of the Site at the northwest corner of the headwall for the culvert under Deer Valley Road. This hydrant is to be relocated west of the proposed driveway into the site. An additional hydrant is proposed at the northwest corner to meet hose lay requirement for the northernmost structure.

According to DSPM Section 6-1.501, a minimum system fire flow of 1,500 gpm is required for commercial, industrial, and multi-family residential developments. The largest structure on site has a footprint of 6,100 sf and does not contain fire walls. Upon final determination of the building construction type being classified as V-A, **Appendix B** of the 2015 International Fire Code indicates the fire flow demand is 1,500 for a duration of two hours. The flow tests provided in **Appendix A** show that the supply meets the demand requirements.

APPENDIX A

FIRE FLOW TEST

Flow Test Summary

Project Name:	EJFT 18159
Project Address:	7601 E Deer Valley Rd, Scottsdale, AZ 85255
Date of Flow Test:	2018-07-09
Time of Flow Test:	7:30 AM
Data Reliable Until:	2019-01-09
Conducted By:	Tayler Lynch & Eder Cueva (EJ Flow Tests) 602.999.7637
Witnessed By:	Jim Demarbiex (City of Scottsdale) 602.541.0586
City Forces Contacted:	City of Scottsdale (602.228.2187)
Permit Number:	C55801
Note	Scottsdale requires a max static pressure of 72 psi for safety factor

Raw Flow Test Data

Static Pressure:	100.0 PSI
Residual Pressure:	96.0 PSI
Flowing GPM:	2,455
GPM @ 20 PSI:	12,378

Data with a 28 PSI Safety Factor

Static Pressure:	72.0 PSI
Residual Pressure:	68.0 PSI
Flowing GPM:	2,455
GPM @ 20 PSI:	9,809

Hydrant F_1

Pitot Pressure (1):	52	PSI
Coefficient of Discharge (1):	0.9	
Hydrant Orifice Diameter (1):	2.5	inches
Pitot Pressure (2):	55	PSI
Coefficient of Discharge (2):	0.9	
Hydrant Orifice Diameter (2):	2.5	inches

Static-Residual Hydrant

Flow Hydrant

Distance Between F_1 and R
287 ft (measured linearly)

Static-Residual Elevation
1771 ft (above sea level)

Flow Hydrant (F_1) Elevation
1774 ft (above sea level)

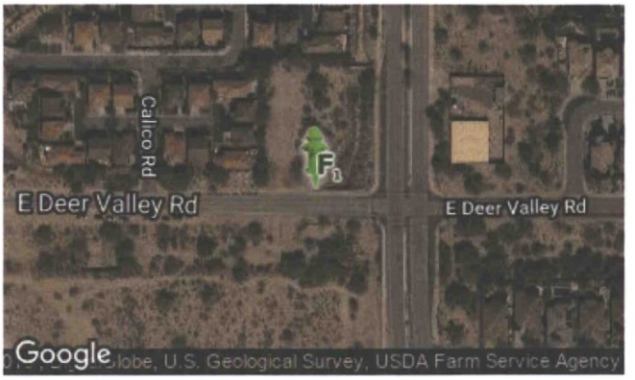
Elevation & distance values are approximate

EJ Flow Tests, LLC
21505 North 78th Ave. | Suite 130 | Peoria, Arizona 85382 | (602) 999-7637 | www.ejengineering.com
John L. Echeverri | NICET Level IV 078493 SME | C-16 FP Contractor ROC 271705 AZ | NFPA CFPS 1915
www.flowtestsummary.com

E·J | Flow Test Summary

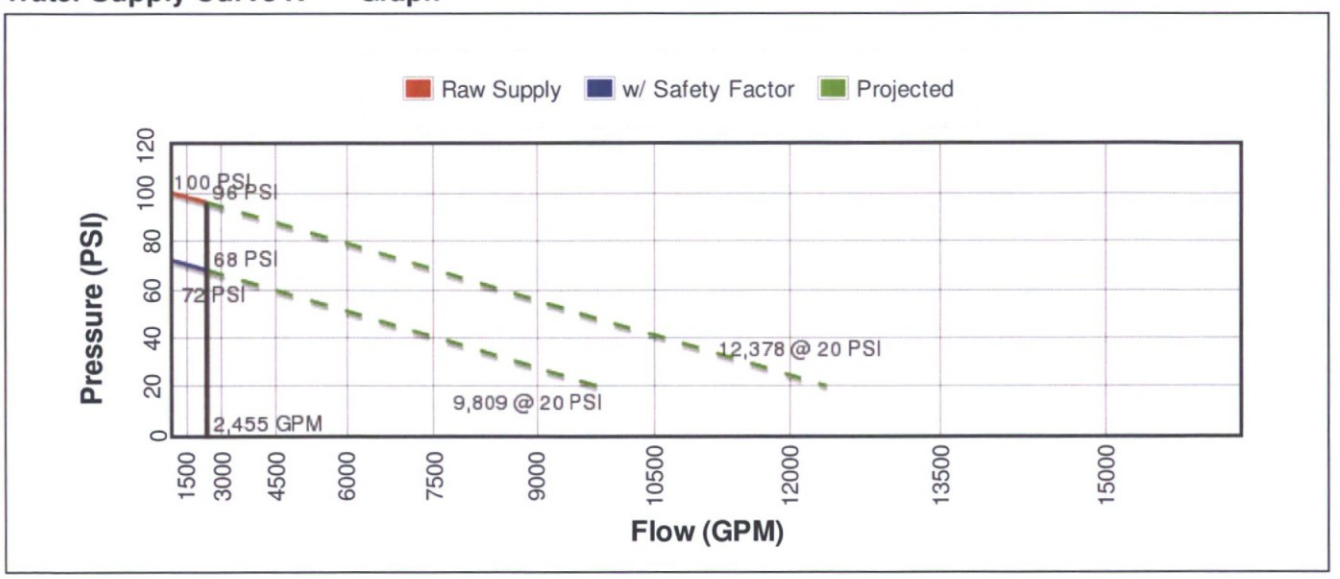
Static-Residual Hydrant

Flow Hydrant (only hydrant F1 shown for clarity)



Approximate Project Site

Water Supply Curve $N^{1.85}$ Graph



APPENDIX B

PRELIMINARY GRADING & DRAINAGE PLAN

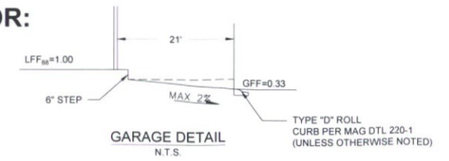
Volume Provided				
Number of chambers		6	Volume Per Chamber	110 cf
Number of End Caps		2	Volume Per End Cap	16 cf
Area		440 sf	Excavation Length	52 lf
Perimeter		121 ft	Excavation Width	8 lf
Stone above		12 in	Excavation Depth (Including cover)	6 lf
Stone below		9 in		
Voids in stone		40 %		
Length of Isolator Row		47 ft		
Volume in chambers	# of Chambers * 109.9	659 cf		
Volume in End Caps	# of caps * 15.6	31 cf		
Volume of excavation	L X W X D	2422 cf		
Amount of stone	Vexc - Vchmb	1731 cf		
Volume in stone	Void % * $Amount_{stone}$	693 cf		
Amount of Filter Fabric	2*Area + Perimeter *(6 +Cover)	1822 sf		
Volume Provided	$V_{chmb} + V_{stone}$	1352 cf		

First Flush Volume	
V= CDA**	V = First Flush Volume (cf)
	C = Average Runoff Coefficient*
	D = First Flush Precipitation Depth (ft)
	A = Net Area of Disturbed Area (sf)
V = 0.94 x 0.04 x 29,597	
V = 1168 cf	

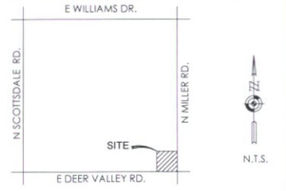
*C Values are from FCDMC Hydrology Manual
**First Flush equation is from COS Design Manual

PRELIMINARY GRADING AND DRAINAGE PLAN FOR:
DEER VALLEY TOWNHOMES
N MILLER ROAD & E DEER VALLEY ROAD
SCOTTSDALE, ARIZONA

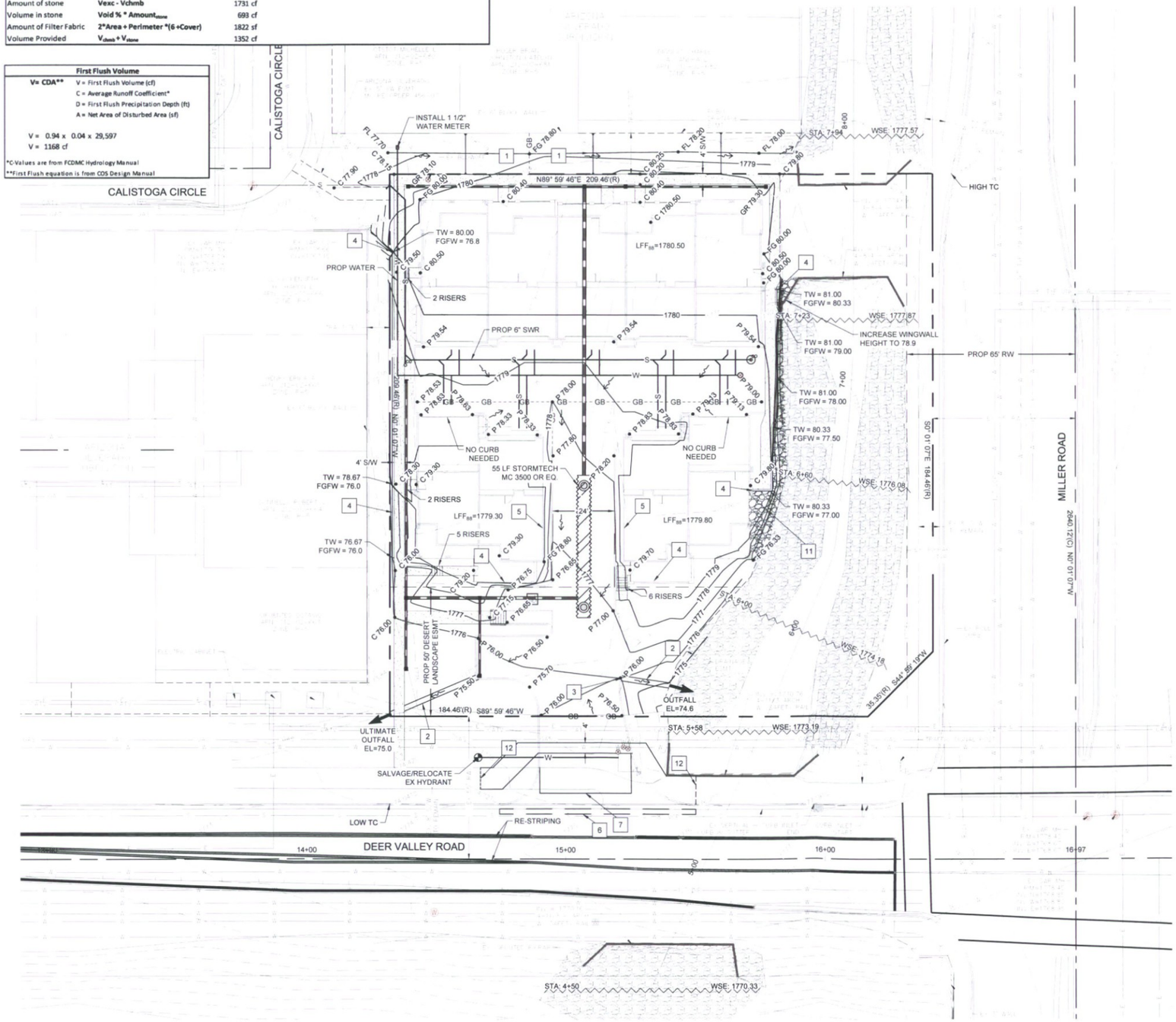
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.



GARAGE DETAIL
N.T.S.



VICINITY MAP



OWNER / DEVELOPER

BEARDSLEY 22, INC
222 W LINGER LN, PHOENIX, AZ 85021

CONTACT: SCOTT WARD
PHONE: (480) 899-4330
EMAIL: WARDDEVELOPMENT@YAHOO.COM

ARCHITECT

WHITNEYBELL PERRY, INC
575 W CHANDLER BLVD, SUITE 123
CHANDLER, ARIZONA 85224

CONTACT: TERESA HILL
PHONE: (480) 857-8364
EMAIL: TERESA@WHITNEYBELLPERRY.COM

CIVIL ENGINEER

TERRASCAPE CONSULTING
1102 EAST MISSOURI AVENUE
PHOENIX, ARIZONA 85014

CONTACT: LISA NELSON, P.E.
PHONE: (480) 454-1807
FAX: (602) 230-2458
EMAIL: LNELSON@TERRASCAPE.US

PROJECT DATA:

APN: 212-02-010E
NET AREA: 0.68 ACRES
PARCEL AREA: 1.00 ACRES

ADDRESS: 21818 N MILLER RD,
SCOTTSDALE, AZ 85255

BASIS OF BEARING

THE SOUTH LINE OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST. SAID LINE HAVING AN ASSUMED BEARING OF N 89° 32' 09" E.

BENCHMARK

A CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE AT THE INTERSECTION OF SCOTTSDALE ROAD AND DEER VALLEY ROAD, C.O.S. ELEVATION = 1747.03 (NAVD 88).

FLOOD INFORMATION

FLOOD ZONE DESIGNATION "X" F.E.M.A. FLOOD INSURANCE RATE MAP, MAP NUMBER 04013C1320L, PANEL 1320 OF 4425, DATED AUGUST 25, 2017. ZONE "X" AREAS DETERMINED TO BE OUTSIDE OF 0.2% ANNUAL CHANCE FLOODPLAIN.

LEGEND

- BOUNDARY
- EX PROPERTY LINE
- SETBACK
- EASEMENT
- STORM DRAIN
- SANITARY SEWER LINE
- DOMESTIC WATERLINE
- FIRELINE
- DRYWELL
- STORMTECH RETENTION TANK
- GRADE BREAK LINE
- FIRE HYDRANT
- CLEAN OUT WITH COLLAR
- CLEAN OUT
- VALVE
- 4' MANHOLE
- CATCH BASIN
- YARD DRAIN
- BACKFLOW PREVENTER
- WATER METER
- 93.0 FINISHED GRADE
- HEC-RAS CROSS SECTIONS WATER SURFACE ELEVATION

ABBREVIATIONS

BLDG	BUILDING	LS	LANDSCAPE
C	CONCRETE	MH	MANHOLE
C&G	CURB AND GUTTER	P	PAVEMENT
CO	CLEAN OUT	PROP	PROPOSED
CMP	CORRUGATED METAL PIPE	PUE	PUBLIC UTILITY EASEMENT
DIA	DIAMETER	RW	RIGHT OF WAY
ESMT	EASEMENT	SB	SETBACK
EX	EXISTING	SS	SANITARY SEWER
FFE	FINISHED FLOOR ELEVATION	S/W	SIDEWALK
FGFW	FINISHED GRADE AT FOOT OF WALL	TC	TOP OF CURB
FL	FLOWLINE	TYP	TYPICAL
G	GUTTER	TW	TOP OF WALL
GR	GRATE	WSE	WATER SURFACE ELEVATION
HP	HIGH POINT		

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
5. EXPOSED STEM WALL; REFER TO ARCHITECTURAL PLANS.
6. MIN. 2' SAWCUT AND REMOVE EX. A.C.C.P. ROADWAY. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.
7. INSTALL M-2 DRIVEWAY PER C.O.S. STD. DTL. 2255; SIDEWALK MODIFIED PER PLAN.
8. WIDEN A.C.C.P. ROADWAY TO LIMITS SHOWN.
9. OBLITERATE PAVEMENT MARKINGS
10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING
12. SAWCUT, REMOVE, AND DISPOSE OF CONCRETE TO LIMITS SHOWN OR NEAREST EXPANSION JOINT, EXACT LIMITS TO BE DETERMINED IN THE FIELD. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.

SCALE IN FEET
0 20 40

consulting Terrascape
civil engineering • surveying • urban planning
1102 East Missouri Ave, Phoenix, Arizona 85014 • 575 West Chandler Blvd, #123, Chandler, Arizona 85225
P:(602.297.8733 • F:(602.230.8468 • info@terrascapeconsulting.com • terrascapeconsulting.com

41715 LISA NELSON 08/27/18
REGISTERED PROFESSIONAL ENGINEER ARIZONA U.S.A.
EXPIRES 12/31/2019

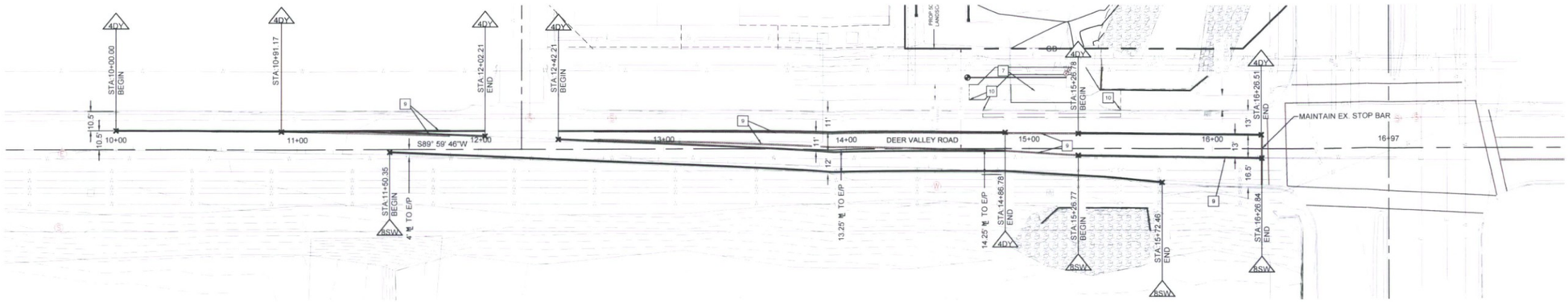
DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811 Call 811 or click Arizona811.com

DATE	DESCRIPTION
08/27/18	CITY SUBMITTAL

CHECKED BY: LMN
DRAWN BY: CMA
TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**
SHEET No. **1 of 2**
PROJECT No. **0800**



LEGEND

BSW — 8" SOLID WHITE LINE

4DY — 4" DOUBLE YELLOW LINE

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
5. EXPOSED STEM WALL; REFER TO ARCHITECTURAL PLANS.
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7. DRIVEWAY PER C.O.S. STD. DTL. 2255; SIDEWALK MODIFIED PER PLAN.
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10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING

SCALE IN FEET
0 30 60

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41715 LISA NELSON 08/27/18
REGISTERED PROFESSIONAL ENGINEER ARIZONA U.S.A.

EXPIRES 12/31/2019

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation.
ARIZONA811 Arizona Blue Stake, Inc.
Call 811 or visit Arizona811.com

DATE	DESCRIPTION
08/27/18	CITY SUBMITTAL

CHECKED BY: LMN

DRAWN BY: CMA

TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**

SHEET No. **2 of 2**

PROJECT No. **0800**

APPENDIX C

IFC – Appendix "B"

APPENDIX B

FIRE-FLOW REQUIREMENTS FOR BUILDINGS

The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance.

SECTION B101
GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases. The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the *fire code official* is authorized to utilize NFPA 1142 or the *International Wildland-Urban Interface Code.*

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the *exterior walls*, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation. Portions of buildings which are separated by *fire walls* without openings, constructed in accordance with the *International Building Code,* are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings, Group R-3 and R-4 buildings and townhouses. The minimum fire-flow and flow duration requirements for one- and two-family *dwellings*, Group R-3 and R-4 buildings and townhouses shall be as specified in Tables B105.1(1) and B105.1(2).

B105.2 Buildings other than one- and two-family dwellings, Group R-3 and R-4 buildings and townhouses. The minimum fire-flow and flow duration for buildings other than one- and two-family *dwellings*, Group R-3 and R-4 buildings and townhouses shall be as specified in Tables B105.2 and B105.1(2).

TABLE B105.1(1)
REQUIRED FIRE-FLOW FOR ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

FIRE-FLOW CALCULATION AREA (square feet)	AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
0-3,600	No automatic sprinkler system	1,000	1
3,601 and greater	No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2) at the required fire-flow rate
0-3,600	Section 903.3.1.3 of the *International Fire Code* or Section P2904 of the *International Residential Code*	500	1/2
3,601 and greater	Section 903.3.1.3 of the *International Fire Code* or Section P2904 of the *International Residential Code*	1/2 value in Table B105.1(2)	1

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m.

TABLE B105.1(2)
REFERENCE TABLE FOR TABLES B105.1(1) AND B105.2

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.
a. Types of construction are based on the *International Building Code*.
b. Measured at 20 psi residual pressure.

TABLE B105.2
REQUIRED FIRE-FLOW FOR BUILDINGS OTHER THAN ONE- AND TWO-FAMILY DWELLINGS, GROUP R-3 AND R-4 BUILDINGS AND TOWNHOUSES

AUTOMATIC SPRINKLER SYSTEM (Design Standard)	MINIMUM FIRE-FLOW (gallons per minute)	FLOW DURATION (hours)
No automatic sprinkler system	Value in Table B105.1(2)	Duration in Table B105.1(2)
Section 903.3.1.1 of the *International Fire Code*	25% of the value in Table B105.1(2)[a]	Duration in Table B105.1(2) at the reduced flow rate
Section 903.3.1.2 of the *International Fire Code*	25% of the value in Table B105.1(2)[b]	Duration in Table B105.1(2) at the reduced flow rate

For SI: 1 gallon per minute = 3.785 L/m.
a. The reduced fire-flow shall be not less than 1,000 gallons per minute.
b. The reduced fire-flow shall be not less than 1,500 gallons per minute.

LISTEN | DESIGN
PLAN | BUILD

terrascapeconsulting.com

Preliminary Basis of Design Report

Sewer

Deer Valley Townhomes

NWC of Miller Road & Deer Valley Road

City of Scottsdale

Maricopa County, Arizona

TSC Project No. 0800

August 2018

Prepared for:

Beardsley 22, Inc
222 W Linger Lane,
Phoenix, AZ 85021

consulting Terrascape

civil engineering • surveying • urban planning

Table of Contents

List of Figures

List of Appendices

1.0 Introduction

The proposed Deer Valley Townhomes development (Project) consists of attached townhomes split between three (3) buildings on a one acre parcel. The Site is defined by the parcel boundary for APN# 212-02-010E and is located at the northwest corner of Miller Road and Deer Valley Road in Scottsdale (see figure 1 below). The current project zoning is PCOC and proposed project zoning is R-3. The site is currently undeveloped and the proposed development will be constructed all at once and will not be phased.

The purpose of this report is to evaluate the existing infrastructure and to determine if the proposed design will adequately support the calculated demands for the proposed developed Site. The Project will be designed and developed in accordance with the 2018 City of Scottsdale Design Standards & Policies Manual (DSPM), County, and State requirements.

Figure 1: Location Map

2.0 Sewer System

The site is a vacant lot with a channel along the east side. There are several existing sewer lines surrounding the property, according to City quarter section maps. Deer Valley Road has an existing 8" VCP sanitary sewer line that flows east to west. An 8" PVC sewer line exists in Miller Road that flows south. An existing sewer line exists in Calistoga Circle with a service stub extends into the Site at the northwest corner. **Appendix A** shows the exact connection location. The proposed sewer system will utilize the existing sewer stub to the property and tie into the main within Calistoga Circle. A 6" PVC sewer line will service the site with 4" laterals to each home.

Based on discussions with the City of Scottsdale, the downstream sewer main and wastewater treatment plant has sufficient capacity to support the Project's sewer proposed flows. The sewer flow from the Project will be conveyed to the City of Scottsdale Wastewater Treatment Plant, 4.2 miles downstream.

3.0 Sewer Analysis

3.1 Jurisdictional Design Criteria

Based on the DSPM all sewer lines shall be designed to provide a minimum peak flow velocity of 2.5 feet per second when flowing completely full and a maximum velocity of 10.0 feet per second. A Manning's roughness coefficient, "n", of 0.013 will be used for all pipe materials. Per MAG Standard Detail 404, the minimum slope requirement for six (6) inch diameter sewer service is 2.08%. Upon completion of the plumbing design in the construction document phase, the service lines to each home or structure will be sized. Cleanouts are located at any direction change greater than 45° or at the end of the line. All buildings are required to have a two-way cleanout at the building per 2015 International Plumbing Code (IPC). Cleanout spacing is equal to or less than 100'.

3.2 Proposed Wastewater Flows

This report supplements preliminary plans proposing 9 residential units. As a result, the final total projected wastewater flow is calculated as follows:

Average Daily Demand =	100 gpcpd
Average Daily Flow (ADF) = 9 DU x 100 gpcpd x 2.5 p/DU =	2,250 gpd
Peak Daily Flow (PDF) = ADF x 4.0 =	9,000 gpd

*ADF based on DSPM section 7-1.403.A
*PDF based on DSPM figure 7-1.2

3.3 Sewer Calculations

Flow capacity per Manning's formula for uniform pipe flow:

$$Q = \frac{1.49}{n}(A)(R_h)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

Q =	*Pipe capacity (cfs)*
n =	*Manning's roughness coefficient*
A =	*Cross sectional area (ft²)*
R =	*Hydraulic radius (ft.)*
S =	*Minimum slope (ft/ft)*

Capacity for a full flowing 6" diameter pipe with a minimum slope of 0.0208 ft/ft:

$$\frac{1.49}{0.013}(\pi 0.25^2)(0.13)^{\frac{2}{3}}(0.0208)^{\frac{1}{2}} = 0.81\ cfs = 523{,}517\ gpd$$

9,000 gpd << 523,517 gpd pipe capacity

Flow velocity per Manning's formula for uniform pipe flow:

$$V = \frac{1.49}{n}(R_h)^{\frac{2}{3}}(S)^{\frac{1}{2}}$$

Where:

V =	*Pipe velocity (ft/s)*
n =	*Manning's roughness coefficient*
R_h =	*Hydraulic radius (ft.)*
S =	*Minimum slope (ft/ft)*

The full-flow velocity computed for a 6" sewer line:

$$\frac{1.49}{0.013}(0.13)^{\frac{2}{3}}(0.0208)^{\frac{1}{2}} = 4.12\ ft/s$$

4.12 fps > 2.5 fps

4.0 Conclusion

As demonstrated, the proposed sewer system for Deer Valley Townhomes will be in accordance with the 2018 City of Scottsdale Design Standards & Policies Manual and have the capacity to service 9 townhomes on a one acre site. The proposed demand is well under the proposed capacity and an acceptable velocity is obtained.

APPENDIX A

PRELIMINARY GRADING & DRAINAGE PLAN

Volume Provided				
Number of chambers		6	Volume Per Chamber	110 cf
Number of End Caps		2	Volume Per End Cap	16 cf
Area		440 sf	Excavation Length	52 lf
Perimeter		121 ft	Excavation Width	8 lf
Stone above		12 in	Excavation Depth (Including cover)	6 lf
Stone below		9 in		
Voids in stone		40 %		
Length of Isolator Row		47 ft		
Volume in chambers	# of Chambers * 109.9	659 cf		
Volume in End Caps	# of caps * 15.6	31 cf		
Volume of excavation	L X W X D	2422 cf		
Amount of stone	Vexc - Vchmb	1731 cf		
Volume in stone	Void % * $Amount_{stone}$	693 cf		
Amount of Filter Fabric	2*Area + Perimeter *(6 +Cover)	1822 sf		
Volume Provided	$V_{chmb} + V_{stone}$	1352 cf		

First Flush Volume

V= CDA**
- V = First Flush Volume (cf)
- C = Average Runoff Coefficient*
- D = First Flush Precipitation Depth (ft)
- A = Net Area of Disturbed Area (sf)

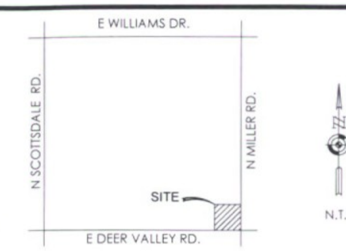
V = 0.94 x 0.04 x 29,597
V = 1168 cf

*C-Values are from FCDMC Hydrology Manual
**First Flush equation is from COS Design Manual

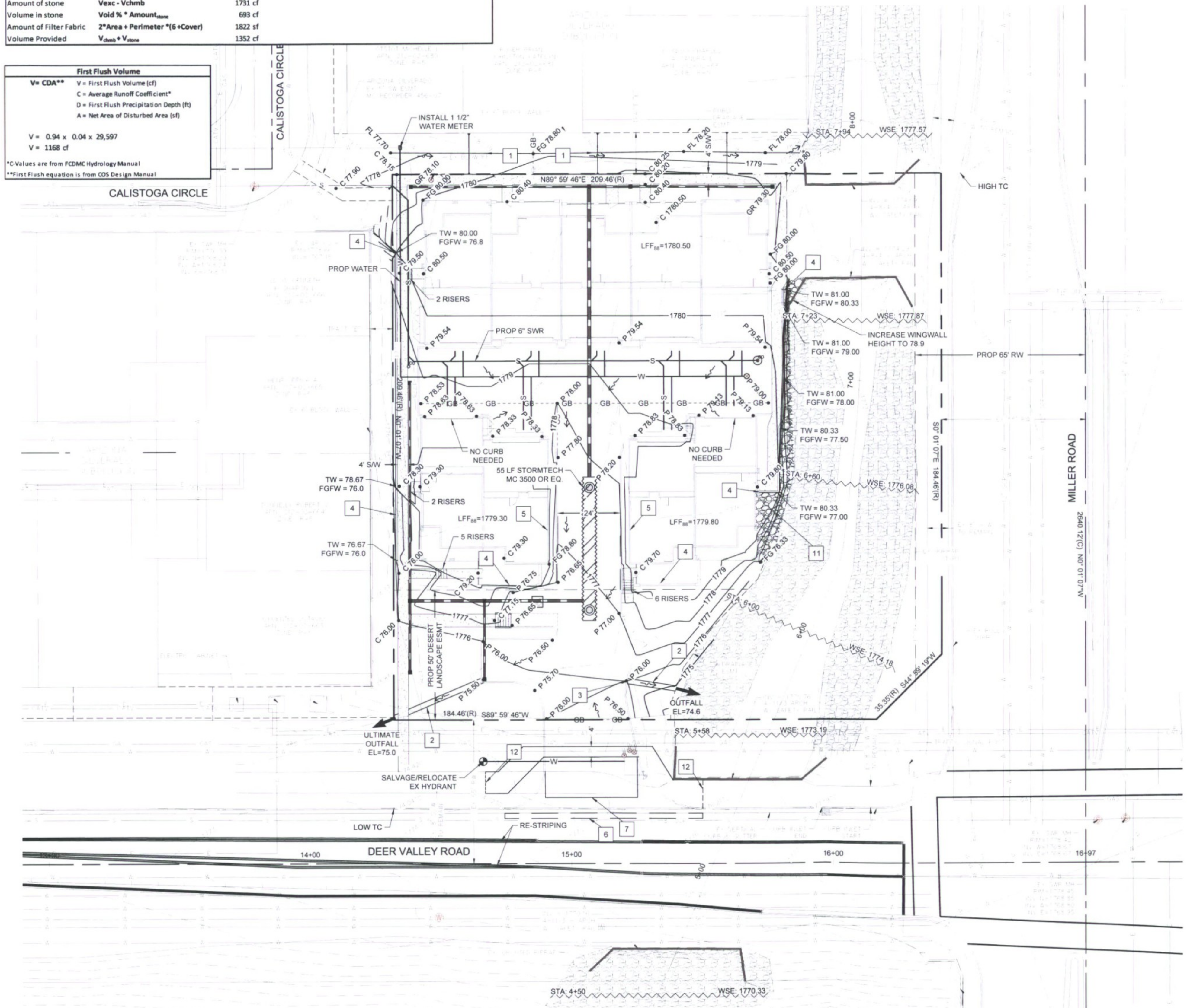
PRELIMINARY GRADING AND DRAINAGE PLAN FOR:
DEER VALLEY TOWNHOMES
N MILLER ROAD & E DEER VALLEY ROAD
SCOTTSDALE, ARIZONA

A PORTION OF THE SOUTHWEST QUARTER OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA.

GARAGE DETAIL
N.T.S.



VICINITY MAP



OWNER / DEVELOPER

BEARDSLEY 22, INC
222 W LINGER LN, PHOENIX, AZ 85021

CONTACT: SCOTT WARD
PHONE: (480) 899-4330
EMAIL: WARDDEVELOPMENT@YAHOO.COM

ARCHITECT

WHITNEYBELL PERRY, INC
575 W CHANDLER BLVD, SUITE 123
CHANDLER, ARIZONA 85224

CONTACT: TERESA HILL
PHONE: (480) 857-8364
EMAIL: TERESA@WHITNEYBELLPERRY.COM

CIVIL ENGINEER

TERRASCAPE CONSULTING
1102 EAST MISSOURI AVENUE
PHOENIX, ARIZONA 85014

CONTACT: LISA NELSON, P.E.
PHONE: (480) 454-1807
FAX: (602) 230-2458
EMAIL: LNELSON@TERRASCAPE.US

PROJECT DATA:

APN: 212-02-010E
NET AREA: 0.68 ACRES
PARCEL AREA: 1.00 ACRES

ADDRESS: 21818 N MILLER RD, SCOTTSDALE, AZ 85255

BASIS OF BEARING

THE SOUTH LINE OF SECTION 14, TOWNSHIP 4 NORTH, RANGE 4 EAST. SAID LINE HAVING AN ASSUMED BEARING OF N 89° 32' 09" E.

BENCHMARK

A CITY OF SCOTTSDALE BRASS CAP IN HANDHOLE AT THE INTERSECTION OF SCOTTSDALE ROAD AND DEER VALLEY ROAD. C.O.S. ELEVATION = 1747.03 (NAVD 88).

FLOOD INFORMATION

FLOOD ZONE DESIGNATION "X" F.E.M.A. FLOOD INSURANCE RATE MAP, MAP NUMBER 04013C1320L, PANEL 1320 OF 4425, DATED AUGUST 25, 2017. ZONE "X" AREAS DETERMINED TO BE OUTSIDE OF 0.2% ANNUAL CHANCE FLOODPLAIN.

LEGEND

- BOUNDARY
- EX PROPERTY LINE
- SETBACK
- EASEMENT
- STORM DRAIN
- SANITARY SEWER LINE
- DOMESTIC WATERLINE
- FIRELINE
- DRYWELL
- STORMTECH RETENTION TANK
- GRADE BREAK LINE
- FIRE HYDRANT
- CLEAN OUT WITH COLLAR
- CLEAN OUT
- VALVE
- 4' MANHOLE
- CATCH BASIN
- YARD DRAIN
- BACKFLOW PREVENTER
- WATER METER
- FINISHED GRADE
- HEC-RAS CROSS SECTIONS WATER SURFACE ELEVATION

ABBREVIATIONS

BLDG	BUILDING	LS	LANDSCAPE
C	CONCRETE	MH	MANHOLE
C&G	CURB AND GUTTER	P	PAVEMENT
CO	CLEAN OUT	PROP	PROPOSED
CMP	CORRUGATED METAL PIPE	PUE	PUBLIC UTILITY EASEMENT
DIA	DIAMETER	RW	RIGHT OF WAY
ESMT	EASEMENT	SB	SETBACK
EX	EXISTING	SS	SANITARY SEWER
FFE	FINISHED FLOOR ELEVATION	S/W	SIDEWALK
FGFW	FINISHED GRADE AT FOOT OF WALL	TC	TOP OF CURB
FL	FLOWLINE	TYP	TYPICAL
G	GUTTER	TW	TOP OF WALL
GR	GRATE	WSE	WATER SURFACE ELEVATION
HP	HIGH POINT		

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN.
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
3. 2' WIDE CURB OPENING.
4. RETAINING WALL WITH SAFETY RAIL. WALL HEIGHT VARIES, PER PLAN. WALL FOOTING SHALL EXTEND BELOW TOP OF BANK TURN DOWN FOR RIP RAP, WHERE APPLICABLE ALONG EX. CHANNEL.
5. EXPOSED STEM WALL; REFER TO ARCHITECTURAL PLANS.
6. MIN. 2' SAWCUT AND REMOVE EX. A.C.C.P. ROADWAY. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.
7. INSTALL M-2 DRIVEWAY PER C.O.S. STD. DTL. 2255; SIDEWALK MODIFIED PER PLAN.
8. WIDEN A.C.C.P. ROADWAY TO LIMITS SHOWN.
9. OBLITERATE PAVEMENT MARKINGS.
10. MATCH EXISTING.
11. 2' DEEP RIP RAP D50 = 6" TO BE INSTALLED AGAINST RETAINING; MATCH EXISTING.
12. SAWCUT, REMOVE, AND DISPOSE OF CONCRETE TO LIMITS SHOWN OR NEAREST EXPANSION JOINT. EXACT LIMITS TO BE DETERMINED IN THE FIELD. PROTECT EXISTING ASPHALT CONCRETE TO REMAIN.

SCALE IN FEET: 0, 20, 40

Terrascape consulting
civil engineering • surveying • urban planning
1102 East Missouri Ave, Phoenix, Arizona 85014 • 575 West Chandler Blvd, #123, Chandler, Arizona 85225
P:602.297.8732 • F:602.230.8458 • info@terrascapeconsulting.com • terrascapeconsulting.com

41715 LISA NELSON 08/27/18
EXPIRES 12/31/2019

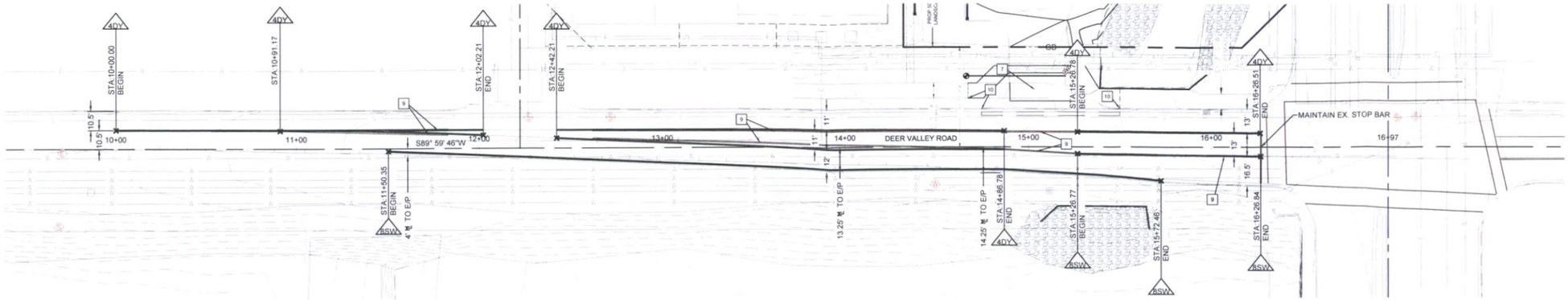
DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

DATE	DESCRIPTION
08/27/18	CITY SUBMITTAL

CHECKED BY: LMN
DRAWN BY: CMA
TITLE: PRELIMINARY GRADING & DRAINAGE PLAN
SHEET No. 1 of 2
PROJECT No. 0800



LEGEND

BSW — 8" SOLID WHITE LINE

4DY — 4" DOUBLE YELLOW LINE

PAVING, GRADING AND DRAINAGE NOTES

1. GRADE TO DRAIN.
2. GRADE 4' WIDE DRAINAGE SWALE TO DRAIN; LINE WITH 4" DIA. LANDSCAPE ROCK.
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SCALE IN FEET
0 30 60

consulting Terrascape
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1102 East Missouri Ave, Phoenix, Arizona 85014 • 875 West Chandler Blvd. #123, Chandler, Arizona 85225
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41715 LISA NELSON 08/27/18
Date Signed
ARIZONA U.S.A.

EXPIRES 12/31/2019

DEER VALLEY TOWNHOMES

PRELIMINARY GRADING & DRAINAGE

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or visit Arizona811.com

DATE	DESCRIPTION
08/27/18	CITY SUBMITTAL

CHECKED BY: LMN

DRAWN BY: CMA

TITLE: **PRELIMINARY GRADING & DRAINAGE PLAN**

SHEET No. 2 of 2

PROJECT No. 0800

Plotted: 08/27/18 4:29 PM By: TACO
File: M:\0800 (ph - Mike & Dan Valley - Scottsdale)\CAD\Preliminary\0800-PRELIM GRD.dwg — = PRELIM GRD PLAN (2)

Transportation Impact and Mitigation Analysis (TIMA)

ACCEPTED
CITY OF SCOTTSDALE
TRANSPORTATION DEPARTMENT

DATE: March 31, 2017

REVIEWER: Alan Rudd

628-PA-2016
Deer Valley Townhomes

3-ZN-2017
3/2/2017

LEE ENGINEERING

ARIZONA
TEXAS
NEW MEXICO
OKLAHOMA

February 24, 2017

Mr. Michael Sudbeck, PE
SP Construction
921 E. Derby Drive
Tempe, AZ 85284

RE: ***Trip Generation Comparison for a Property Located at 21818 N. Miller Road in Scottsdale, Arizona***

Dear Mr. Sudbeck:

This letter is to serve as a trip generation comparison letter concerning a proposed rezoning of a parcel located at the northwest corner of Miller and Deer Valley Roads in Scottsdale, Arizona. This analysis compares the highest trip generation potential of the site under the Existing and Proposed zoning to the planned site development per the City of Scottsdale's *Design Standards and Policies Manual,* a recent email you have provided from Mr. Jesus Murillo, and voice mail received at our office on 2/17/2017 from Mr. Phillip Kercher, both of whom are with the City of Scottsdale.

Proposed Site and Site Characteristics

The subject site is located at the northwest corner of Miller Road and Deer Valley Road consisting of Accessor Parcel Number 212-02-010E, as highlighted in Figure 1. The Maricopa County Assessors website identifies the parcel size at 43,561 square feet (SF). The parcel is currently unimproved, however, a drainage and flood control easement (D&FCE 018365) is located along the east side of the property to direct storm water runoff from north to south with box culverts existing at the northeast and southeast property corners. A 5-foot sidewalk easement also exists at the northwest corner of the site connecting to the adjacent subdivision.

Figure 1. Vicinity Map

A copy of the proposed site plan layout is provided as an attachment. The site plan shows an improved parcel that includes 11 townhomes with a 24-foot wide right-in/right-out driveway intersecting southbound Miller Road and a full movement 24-foot wide driveway intersecting Deer Valley Road. The Miller Road driveway is located about 240 feet north of the Deer Valley Road centerline (about 205 feet north of the existing Miller Road crosswalk line) and located over an existing box culvert that crosses the adjacent wash. The driveway is currently positioned within the existing southbound to westbound right turn lane taper. The Deer Valley Road

driveway is located about 225 feet west of the Miller Road centerline (about 175 feet west of the eastbound stop line) and positioned within the eastbound left-turn lane transition taper. Both driveways are located as far away as possible from the existing signal controlled intersection, near the site's north and west property lines.

Existing and Proposed Zoning Characteristics

A change to the underlying zoning for the subject parcel is being requested. From review of the City of Scottsdale's zoning map for the subject parcel, the Existing and Proposed zoning designations are presented below:

- Existing Zoning: PCoP (Planned Convenience Center)
- Proposed Zoning: R-5 (Multi-family Residential)

The City of Scottsdale's Zoning Ordinance provides a Use Table in each zoning designation. The table identifies possible land uses that could be constructed, designated as permitted (P) or conditional use (CU). The following is a selected land use list found under each zoning category. Additional land uses and land use limitations may be associated with the individual land uses, but are not identified in the below listing.

Existing Zoning Land Uses, Selected List (PCoP, Permitted and Conditional Uses)

- Car Wash (CU)
- Courier and Messenger (P)
- Day Care Center within 100 feet of a residential district (CU)
- Dwelling units integrated with business establishments (P)
- Educational Service (P)
- Gas Station (CU)
- Municipal Use (P)
- Office (P)
- Personal Care Service (P)
- Restaurant, excluding drive-through and drive-in restaurants (P)
- Retail (P)
- Veterinary and Pet Care service (P)

Proposed Zoning Land Uses, Selected List (R-5, Permitted and Conditional Uses)

- Day Care Home (P)
- Dwelling, single-family detached or attached (P)
- Dwelling, multi-family (P)
- Municipal Use (P)
- Church (P)
- Day Care Center (CU)
- Orphanage (CU)
- Plant Nursery (CU)
- Public buildings other than hospitals (CU)

When comparing the land uses within each of the two zoning categories, some similar land use types are allowed in both, such as day care center and municipal use. Two of the higher trip generating land uses

within the Existing zoning category are identified to be a restaurant and gas station, while a day care center (applicable to both zonings) is identified as a one of the highest trip rate generators for the proposed zoning.

In reviewing the City's development standards for each, it appears a maximum non-residential floor area ratio of 0.20 is applicable for building sizes based on the gross lot area, or an estimated 8,000 SF for the subject 1-acre parcel.

Trip Generation Comparison

Trip Generation, Ninth Edition, published by the Institute of Transportation Engineers (ITE) 2012, was used to calculate the maximum trip generation potential for the higher generating land uses in the Existing and Proposed zonings as well as for the proposed 11-unit townhome development for the AM peak hour, PM peak hour, and 24-hour weekday condition. The Trip Generation Manual is the industry standard used by traffic and transportation engineers to provide trip generation characteristics for different types of land uses. The trip generation data provided by ITE is segregated into individual land uses and provides an estimate to the number of trip ends similar land uses would generate. A trip end is defined as one entering or one exiting trip during a designated time period. For the purposes of this analysis, all trip ends are assumed to be made via automobile. Some land uses generate a portion of their business from traffic already on the adjacent roadways, identified as pass-by traffic, and therefore only a percentage of the site's total trips may be new vehicles that were not previously on that roadway. No formal or informal site plans have been developed for the hypothetical land use developments used in the analysis, but are based on engineering judgement. The representative development sizes utilized for the site accounting for some of the restrictions that may exist for the individual land use or associated with the parcel itself.

Table 1 displays the total Weekday, AM peak hour, and PM peak hour trip generation characteristics for the selected land uses. All information is based on ITE's average trip rate data and where applicable, average pass-by trip information as presented in the ITE *Trip Generation Handbook, Second Edition*. The gray shaded land use columns are for the Existing zoning condition, the non-shaded column is the highest trip generating land use identified for the Proposed zoning condition. The blue shaded column is for the planned residential development of the subject parcel with 11 townhomes.

The results indicate that the subject parcel under Existing zoning could generate as many as 140 AM peak hour, 108 PM peak hour, and over 1,300 daily trip ends entering and exiting at the site driveways. Under the Proposed zoning condition, the highest trip generating land use could generate 61 AM peak hour, 62 PM peak hour and 370 daily in/out trips. The planned 11-unit Townhome development for the proposed R-5 zoning is only expected to generate 5 AM and 6 PM peak hour trips and less than 70 total daily trips at the site driveways.

Table 1. Trip Generation Estimate Comparison

	Zoning Condition	Existing - Permitted	Existing - Conditional Use	Proposed - Highest Generator	Proposed - Planned Development
Description	Land Use	Restaurant	Gas Station	Institutional	Townhouses
	ITE Land Use Code	939	946 945	565	230
	ITE Land Use Title	Bread/Donut/Bagel Shop without Drive-Through	Gasoline/Service Station w/Convience Market	Day Care Center	Residential Condominium / Townhouse
	Land Use Variable	1000 SF GFA	Veh. Fueling Positions	1000 SF GFA	Dwelling Units
	Variable Amount (X)	2	8	5	11
Trip Rates	Weekday	N/A	162.78	74.06	5.81
	AM Peak Hour	70.22	10.16	12.18	0.44
	PM Peak Hour	28.00	13.51	12.34	0.52
Inbound %	Weekday	50%	50%	50%	50%
	AM Peak Hour	47%	50%	53%	17%
	PM Peak Hour	50%	50%	47%	67%
Total Trips	Weekday	N/A	1302	370	64
	AM Peak Hour Inbound	66	41	32	1
	AM Peak Hour Outbound	74	40	29	4
	PM Peak Hour Inbound	28	54	29	4
	PM Peak Hour Outbound	28	54	33	2
Pass-by Traffic	AM Peak Hour Pass-by Percentage	49%	62%	0%	0%
	PM Peak Hour Pass-by Percentage	50%	56%	0%	0%
	AM Peak Hour Trip Ends	69	50	0	0
	PM Peak Hour Trip Ends	28	60	0	0
New Trips	Weekday	N/A	768	148 ~~370~~	64
	AM Peak Hour Inbound	32	16	32	1
	AM Peak Hour Outbound	40	15	29	4
	PM Peak Hour Inbound	14	24	29	4
	PM Peak Hour Outbound	14	24	33	2

Based on 1 study location only

Source:

1 Trip Generation Manual, 9th Ed, ITE, 2012

2 Trip Generation Handbook, 2nd Ed., ITE, 2012

Conclusion

In comparing the potential maximum trip generation characteristics under the Existing PCoP zoning and the Proposed R-5 site zoning for this parcel, the existing zoning permits land uses that could generate higher inbound and outbound volumes during daily and peak-hour conditions. The 11 townhomes planned for development under the Proposed zoning is considered a very low traffic generator and will generate significantly less traffic than what is permissible under higher intensity land uses possible under both Existing and Proposed zoning conditions.

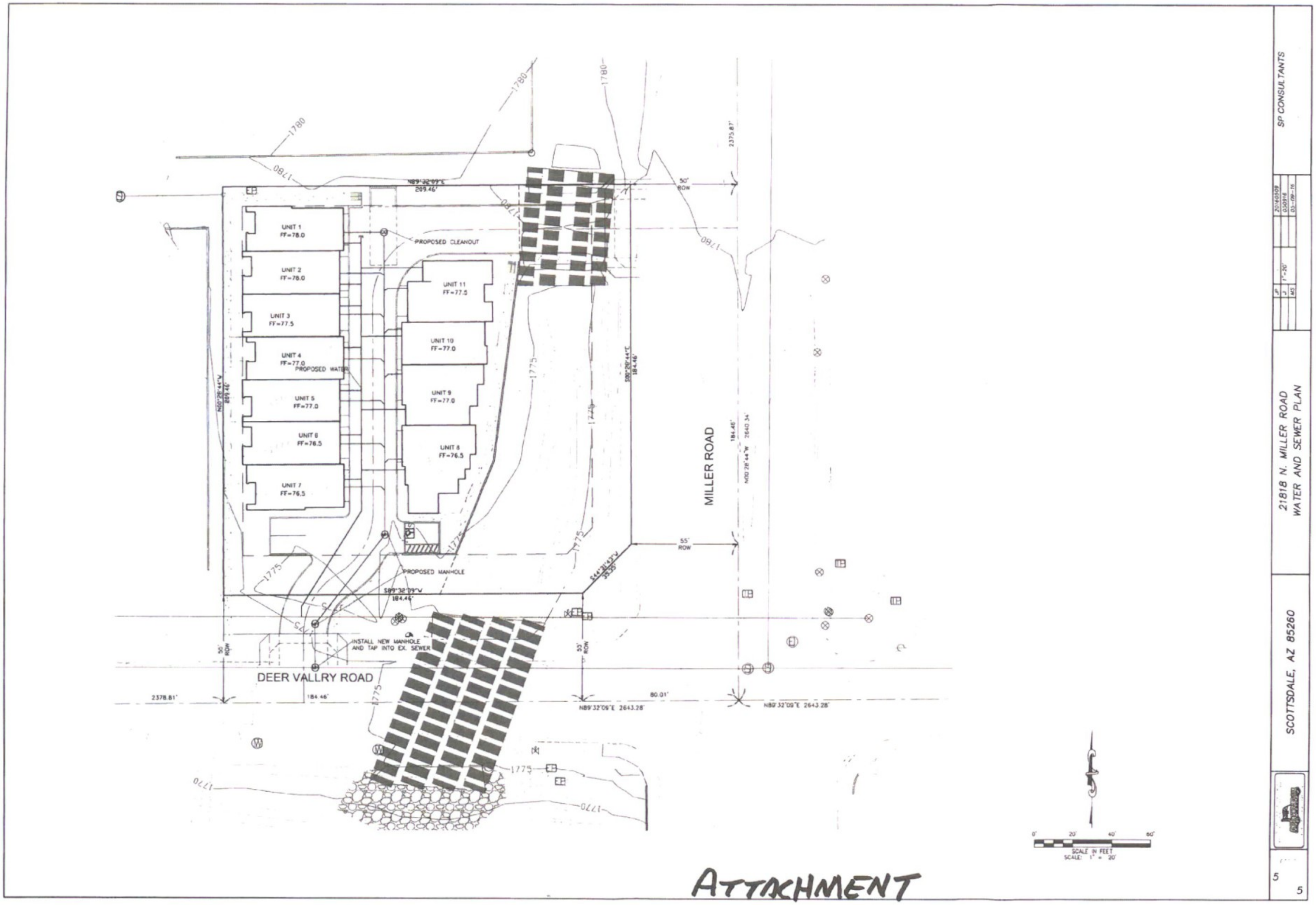
If you have any questions or comments, please feel free to contact me at (602) 955-7206.

Respectfully submitted,

Paul Guzek, PE, PTOE
Lee Engineering, LLC

attachment

EXPIRES 3-31-18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UNIT 2
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UNIT 3
FF=77.5
UNIT 4
FF=77.0
PROPOSED WATER
UNIT 5
FF=77.0
UNIT 6
FF=76.5
UNIT 7
FF=76.5
UNIT 11
FF=77.5
UNIT 10
FF=77.0
UNIT 9
FF=77.0
UNIT 8
FF=76.5
PROPOSED CLEANOUT
PROPOSED MANHOLE
INSTALL NEW MANHOLE
AND TAP INTO EX. SEWER
DEER VALLRY ROAD
MILLER ROAD
SCALE IN FEET
SCALE: 1" = 20'
SP CONSULTANTS
21818 N. MILLER ROAD
WATER AND SEWER PLAN
SCOTTSDALE, AZ 85260
5
5

ATTACHMENT